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**Vulcanite Portland
Cement**

The
Vulcanite Portland Cement Co.

Philadelphia, Pa., U. S. A.

691.5

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Obs.
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Philadelphia, Pa. U. S. A.

Vulcanite Portland Cement Company

JOHN B. LOBER, President

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THE SOUTH



To the Reader

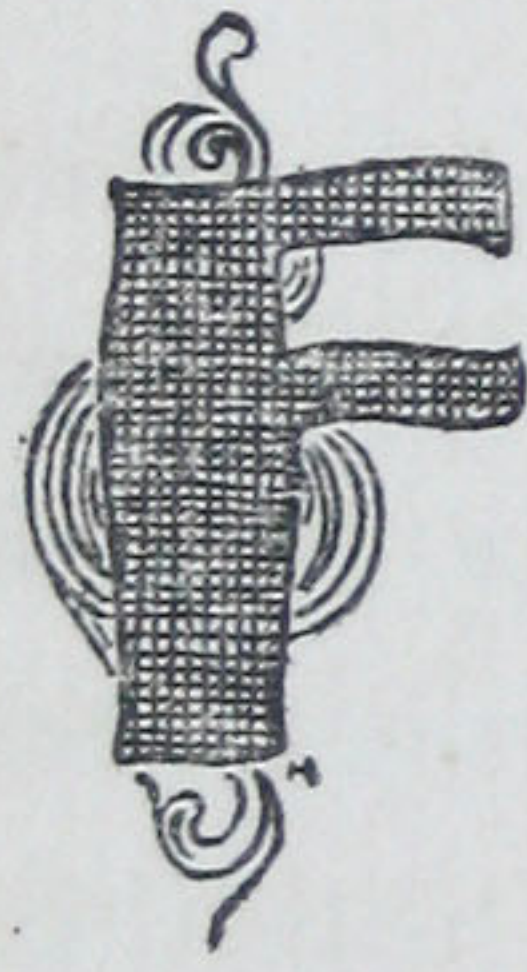
The considerations which have led us to put forth this little book are not wholly selfish, nor have we been prompted solely by the desire to exploit our own plant and products or to celebrate our success. But acquaintance with the literature of the subject has forced upon us the conviction that a plain, untechnical talk on Portland Cement would prove helpful and would be appreciated by numbers of men whose busy vocations have prevented them from investigating, in all its important phases, a material which they are constantly using; and that the experience and knowledge which we have accumulated at the cost of time, labor and money, if placed at their disposal in convenient form, might prove welcome and profitable to them in their chosen fields of operation.

Herein is no attempt to write a history of the cement business. This task has been ably performed several times; but the results, while interesting, are little helpful to the practical user of cement. We offer merely a plain statement of what we have done and are doing in the cement business, and our purpose has been to make this statement so clear that it can be comprehended without labor or loss of time by the busiest architect, builder or contractor as well as by the unprofessional consumer of cement.

If this book shall enlighten one reader as to the value of good Portland Cement, the skill and care necessary to produce it, the proper methods of using it, the improper methods to be avoided, our object will have been attained and we shall regard our labor in preparing the book as profitably and satisfactorily expended.

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What is Portland Cement?



FREDERICK H. LEWIS, member of the American Society of Civil Engineers, has defined Portland Cements in terms which can scarcely be improved upon, either for comprehensiveness or clearness. He says:

“Natural Rock Cements, variously known as Rosendale natural cements, Roman Cements and hydraulic limes, are made simply by driving off the carbonic acid from argillaceous limestones. This is done at the low temperature of an ordinary lime kiln—say from 1000 to 1200 degrees Fahrenheit. The soft yellow stone which is thus obtained is then ground to powder, and this constitutes the finished product.

“Portland Cement, on the other hand, according to recent European specifications, ‘shall be produced by the grinding of scorified clinker obtained by the calcination to incipient vitrification of an intimate mixture of carbonate of lime and of clay accurately proportioned, chemically and physically homogenous in all its parts.’ The distinction is that in making Portland Cement there is an artificial mixture of the raw materials—a calcination at a temperature above 2000 degrees Fahrenheit, and that purer raw materials are used than are necessary for natural cements.”

S. B. Newberry writes:

“True Portland Cement, of uniform and reliable quality can be made only from an artificial mixture of the raw materials.”

Our definition of Portland Cement is, limestone and clay, or similar materials containing silica, lime and alumina, in fixed proportions, mechanically mixed and fused to a clinker, which is then ground into a fine powder.

When the fine powder is mixed with water a chemical action occurs which changes it into a hard mass. This change which the cement mortar undergoes in passing from the plastic to the solid state is called "setting" and usually takes only a few hours.

After the "setting" has taken place the mass begins gradually to increase in cohesive strength and it is said to "harden." *It usually requires from six months to a year for a cement to reach its full strength.*

The brands of Portland Cement are legion, and their qualities as variable as their names. An inspection of the list of foreign and domestic brands is bewildering even to many of experience, yet there is little difficulty attending the selection of the best, if we do not lose sight of the axiom that "the best Portland Cement is the one which has given the greatest general satisfaction and has long passed out of the experimental stage," for it must be the cement in whose manufacture has been exercised the greatest precision, and which is absolutely free from foreign materials or adulteration.

The Vulcanite Portland Cement Company began the manufacture of cement in 1895. The capacity of the original mill—now known as "No. 1," was 250 barrels per day. The high quality of the cement was recognized at once.

Its success was instantaneous, its reception most flattering and its popularity so marked, that in the short space of seven years the output of the plant has increased to 4000 barrels per day, or 1,400,000 barrels per year.

This magnificent result, and the encomiums of engineers everywhere, have not been easily earned. There is no royal road to success, and "Vulcanite" Portland Cement is a monument to painstaking care, labor, and large, liberal expenditure.

Given the proper cement rock, machinery, and a knowledge of what is needed, the whole secret of Portland Cement making is *care*—never-ending, exacting care. Care in selecting materials; care in preparing them; care in combining them; care that visions of profit do not lead to what appears to be a harmless adulteration, but which in every instance results in the deterioration of the product.

In the manufacture of Vulcanite Portland Cement there is no rushing of raw materials from quarries to crushers, from crushers to mills, from mills to kiln, which is frequently done to save time and expense. But "haste is made slowly" so as to surely produce a uniformly sound and reliable cement, and this has made for "Vulcanite" Portland its high reputation as a side-walk cement, and has fully justified our care and extra expenditure.

The Works of the Vulcanite Portland Cement Company, at Vulcanite, New Jersey

The Company's plant is located at Vulcanite, Warren County, New Jersey, upon spurs of the Central Railroad, and consists of 250 acres of land, with quarries, containing an inexhaustible supply of the finest quality of argillaceous limestone or cement rock, and three factories. No. 1, the original mill, having five rotary kilns; No. 2 having six, and No. 3, having ten. These factories are all within short distances of each other, but each is complete and entirely independent of the others and has its own quarry outfits, cable tramways, and power installation.

This arrangement is the most advantageous possible, for should one mill be put out of commission by fire, or other causes, the others, being entirely independent can continue, and thus a certain supply of cement is assured.

No better proof of the success of "Vulcanite" Portland Cement is needed than the necessity for the building of Mill No. 3, which in capacity of production equals the combined outputs of mills No. 1 and No. 2, and which added to them gives a grand total production of 1,400,000 barrels of finished cement per year.

The Manufacture of Vulcanite Portland Cement

Vulcanite Portland Cement differs from other portland cements in the care with which it is prepared, the high development of the details of manufacture, and the systematic course of selection and inspection which it undergoes at every step of the process. The result is a technically perfect cement and strict uniformity of product. Wherever possible the processes are mechanical, insuring at once greater efficiency, larger output and more economical production.

The cement rock leaves the quarries in skips on rope tramways, and arriving in front of the stone house is dumped into cars of three tons capacity. As the cars are filled pieces of rock are taken from each car as a laboratory sample. The cars are then run into the Stone House and emptied into marked bins.

When a bin is full, an analysis is made which shows the average composition of its contents. As the cement rock is frequently lacking in lime it is necessary to add limestone. This is brought by rail and also emptied into bins in the stone house, samples being taken from each car as it arrives and subjected to laboratory examination. As each bin is filled with limestone an analysis is made to ascertain the average composition of the contents of the bin, as in the case of the cement rock.

An analysis having determined the proper proportions, the cement rock and limestone are mixed together by weight and charged into a crusher, and by it reduced furthermore.

This analyzing and weighing is done to assure a mixture uniform in composition, so that when it reaches the kilns it can be fused without varying the temperature and thus result in a hard, evenly burned clinker.

From the crushers the mixed rock goes to screens, from screens to driers, which deprive it of all moisture, from driers to raw mills which grind it finely, and intimately mingle the cement and limestone. From the "raw" mills it goes to the kilns.

The kilns at Vulcanite are "Rotary Continuous," so named to distinguish them from the now almost obsolete stack and shaft kilns, used in small plants and

foreign countries. The rotary system is modern, and experience proves it to be the only correct one for making cement clinker.

The firing of the kilns, being an important factor in the manufacture of cement, is unique. Finely pulverized coal, especially prepared, is mixed with air so as to form an approximate gas, and introduced into the kiln by an injector-like apparatus and being ignited produces an intense heat of uniform temperature.

The ground mixture from the "raw" mills is introduced into the kilns at one end, calcined by the intense heat and discharged as cement clinker at the other end.

From the kilns the cement clinker goes into large tank-like coolers where it is cooled by blasts of cold air.

From the coolers the clinker goes to the clinker storage house where it is partially hydrated, and then is taken to the Finishing Mills, which pulverize it into portland cement, after being ground to the required degree of fineness, (viz:— 20 per cent. residue on a sieve containing 40,000 meshes to the square inch), it is conveyed to the store houses where it is cooled and fully hydrated.

After it is thoroughly "cured" it goes to the packing department, where it is weighed into bags and barrels, and is ready for shipment.

The Laboratory and What is Done There

LABORATORY

The Laboratory is in charge of a chemist of long experience, assisted by technical graduates. The regular chemical work is the examination of rock drillings, analyses of the raw rock in the Stone Store House, limestone which is added to the cement rock, the raw mixture, burned clinker, daily grindings of the finished cement, average bin samplings, and various samples of coal.

The methods used are gravimetric and volumetric forms of analysis, recognized as standard in all laboratories.

Coal samples are analyzed, for moisture, volatile combustible matter, fixed carbon, ash, and sulphur, because many so-called gas coals are low in volatile hydrocarbons and not adapted to cement burning.

It being desirable to obtain a coal, for burning in the kiln, the ash from which will not cause any material change in the composition of the cement, the amount of ash is not only determined, but likewise the component parts of the ash itself are ascertained.

PHYSICAL

The cement from each bin, in the store house, after it is filled, and each car-load, ready for shipment, is separately treated for set, fineness, tensile strain, and various pat tests, comprising air, water, boiling water, steam, kiln, and calcium chloride immersion.

The specific gravity of the cement is determined daily.

Tensile tests are made, and briquettes, of every filling of each bin, are made and kept for periods ranging from seven days to ten years. These records not only keep the Company in touch with the product of the immediate present, but have proven instructive, and of great interest as to the product of former years.

A small sample of every day's grinding of cement is bottled, properly labelled, and retained for future reference; so that in case of a controversy arising at any time over a certain shipment, we not only have our records to consult, but can submit a portion of the cement in question for analysis.

For our own satisfaction and information, we keep in the laboratory a broken briquette of every series made, and examine the same from time to time.

Seven years have elapsed since we inaugurated the system of chemical and physical testing now in vogue at Vulcanite, and our success in a great measure is due to the diligence and care exercised in this department, and in order to maintain a uniform product *nothing is left untried or taken for granted.*

Suggestions for Testing Cement

These suggestions are made as general and free from technical terms as possible, in order to be more readily understood by the layman.

The object of testing cement is to ascertain its value as a building material by determining whether it meets certain specified requirements.

In case of failure of the shipment to meet the seven days requirement, it should be held to await the results of the twenty-eight day tests. Care should be exercised to protect the shipment from the weather, pending the results of these tests; the cement should be well housed and carefully blocked from the ground.

As the methods for testing cement are not infallible, and since the "personal equation" of the tester renders the results of such tests not only relative but inaccurate, a shipment of cement should not be condemned or rejected, in the event of its failure to meet the requirements, without giving it the benefit of a re-test.

The tests to which cement is subjected should be of the simplest character, even where the best of facilities are available for making such tests.

The best methods, for selecting the samples, determination of fineness, of the proper percentages of water to be used, time of setting, tensile strength and constancy of volume will be considered in the order named, with explanations of all the details involved in their execution.

Sampling

The selection of the sample for testing, while a very simple matter, is important and should be properly done.

A note should be made of the condition of the packages at the time of taking the samples, that is, whether the cement is caked, lumpy or damaged.

Shipments in wooden packages may be sampled through a hole in the centre of one of the staves midway between the heads or in the head, by means of a sampling iron similar to that used by sugar inspectors; in bag shipments, the sample should be taken from the heart of the package with the hand or a scoop. In the wood shipments about half a pint of cement should be taken from one barrel in every ten, while in the bag shipments about one quarter pint should be taken from one bag in every twenty. These ten or twenty individual samples should be thoroughly mixed by passing them through a sieve having twenty meshes per lineal inch; this also removes lumps and foreign material.

Fineness

The coarser particles in cement are generally considered inert and devoid of hardening qualities; the more finely a cement is pulverized, the greater will be the quantity of sand that can be mixed with it and produce a mortar of given strength.

It is usual to determine the percentages of fine and coarse particles by measuring, by weight, the residues on certain standard sieves, usually what are known as the No. 100 and No. 200.

These sieves have about 10,000 and 40,000 meshes per square inch and the wires have diameters of .0045 and .0025 of an inch respectively. While it is impossible to obtain sieves having the theoretical number of meshes per inch, the range should not be greater than from 94 to 100 meshes per lineal inch for the No. 100 sieve and 188 to 200 for the No. 200 sieve.

In specifying a fineness for cement the size of the wire and the number of meshes per inch should also be stated, so that the manufacturer can know what fineness is desired.

The sieves are made of brass wire cloth and the frame usually of brass, is from 6 to 8 inches in diameter, $2\frac{1}{2}$ to 4 inches high, and should be provided with a pan and cover.

About 100 grams of the cement, thoroughly dried at 212° F., makes a convenient quantity to sieve.

The operation of sieving is best accomplished by hand methods, and is complete when no more than one-tenth of one per cent passes through the sieve after one minute continuous sifting. The results should be reported to the nearest tenth of one per cent. The cloth of the sieve should be examined from time to time to detect breaks or other defects which would give rise to incorrect results. A small quantity of large shot or gravel accelerates the work of sieving.

Normal Consistency

The percentage of water to be used in making tests for time of setting, strength and pats for constancy of volume is of the greatest importance. The aim should be to mix each cement with sufficient water to obtain a paste having the same degree of plasticity or to produce what is known as the normal consistency.

Uniformity in the results of tests depends to a great extent on the attainment of a normal consistency each time. Other conditions being the same, great ranges in the percentage of water used will produce wide ranges in the results.

Different brands of cement will require different quantities of water and even different shipments of the same brand or the same shipment at different seasons of the year vary as to the quantity of water required.

With the average cement tester a very plastic mortar will yield higher and far more uniform results than a dry mortar. Besides a very plastic mortar can be mixed much more readily; the paste should not, however, be so wet as to permit shrinkage of the briquettes after molding. The cement should be mixed under uniform conditions; hand methods yield the most uniform results.

Five hundred grams should be used for the determination of the normal consistency; this quantity of cement is placed on the mixing slab or table and a crater formed in the centre, into which a trial percentage of clean water is poured. The material on the outer edge of the crater is turned into the centre and when the

water has been absorbed by the cement, the mixing is completed by kneading the mass vigorously with the hands for one minute; the process of kneading being similar to that used in kneading dough. A sand glass affords a very convenient guide to mix by.

The cements having been worked with the trial percentage of water to a plastic paste, is molded into a ball about 5 centimeters in diameter, by tossing from hand to hand about half a dozen times. The ball is then allowed to fall from a height of one foot, and to be of the proper consistency should not flatten materially or crack. The operation should be repeated with varying percentages of water until the desired consistency is obtained.

For mixtures of sand and cement, i. e., standard mortars the proper percentage of water required can be obtained from the following table :

The best method is to place the test pastes on a rack over water contained in a pan which is covered with a damp cloth kept away from the pastes by means of a wire screen.

More accurate results can be obtained with the Vicat needle apparatus, but as it is more difficult to handle, its use is limited to expert cement testers.

Tensile Strength

The setting of cement is the change from a plastic condition to a solid state.

When cement has set the process of hardening is said to commence. The relative degree of hardening at any age is measured by determining its transverse, compressive, adhesive or tensile strength in pounds per square.

The more general practice is to measure the tensile strength only; and test pieces known as briquettes, having a section at the breaking point of one square inch, are used for the purpose. These test pieces are made of the cement mortar, preserved in moist air for twenty-four hours, then immersed in water maintained at about 70° F. and broken at intervals of 7 and 28 days and other longer periods of time as desired.

For testing the tensile strength either the Fairbanks, Riehle or Olsen machines are used; the preference being for the former of these machines, especially for inexperienced persons, because of its being more nearly automatic.

Molds for making briquettes may be either of brass, bronze, or some equally non-corrosive material. Single molds are generally used, although experience shows that gang molds, since they permit the use of a larger quantity of cement mortar at one time, yield more uniform results. The molds should be wiped with an oily cloth before using; this prevents the cement from sticking to the molds and possibly damaging the briquette when being removed.

At least 500 grams should be used at a time, 1000 grams makes a more desirable quantity since it will make 8 or 10 briquettes.

The French system of weights and measures is most convenient to use because of the relation between the gram and the cubic centimeter.

The mixing and molding should be done on some non-absorbing, non-corroding surface, preferably plate glass,—although marble or slate would do. If a surface of marble or slate is used, it is advisable to keep the surface covered with a wet cloth when not in use, or to thoroughly wet the surface previous to being used; a surface of this character, when not in use becomes quite dry and absorbs some of the water from the first few batches mixed upon it; this renders the mortar drier and materially affects the results, especially with sand mixtures.

If the person making the test is inexperienced, it may be necessary for him to use the smaller quantity, especially with quick setting cements, since it may be impossible for him to work the cement into a plastic paste before the setting commences. In sand mixtures, the mixing should be thoroughly done, as this insures each grain of sand being thoroughly coated with cement; the sand and cement should be thoroughly mixed together dry.

The temperature of the room in which the mixing is done, should be uniform and the air moist. The method of mixing should be the same as that described under "Normal Consistency."

Having worked the mortar to the proper consistency, it is placed in the molds with the hands; the mortar is firmly pressed into the molds with the fingers, and heaped upon the molds and pressed in by drawing the trowel over the surface of the mold in such a manner as to exert a slight pressure; molds should be turned over and the operation repeated.

An excellent practice is to weigh the briquettes upon removal from the molds or the moist closet and before immersion in water; briquettes should be rejected whose weight varies more than five per cent. from the average.

After the molding is completed, care should be taken to keep the briquettes moist, thus preventing them from drying out. The briquettes should be preserved in moist air for the first twenty-four hours; where the briquettes are covered with a damp cloth, the ends of the cloth should be immersed in water and should be kept from direct contact with the briquettes by means of a wire screen or some similar arrangement. The best means is a moist closet.

For the twenty-four hour tests, the briquettes should be preserved in moist air

and placed there immediately after molding. For longer time tests the briquettes should be immersed in water at 70° F. at the end of twenty-four hours in moist air.

The briquettes are usually preserved in water in pans, preferably of the agate ware type, since they can be more readily cleaned and are less liable to corrode. The water should be renewed at least once each week; briquettes should be kept covered with water and the temperature should be kept as near 70° F. as practicable. Where the conditions will permit, large tanks provided with a supply of running water are preferable.

Briquettes should be broken as soon as they are removed from the water. Care should be taken to centre the briquette in the testing machine as cross strains produced by improper centering tend to lower the breaking strength. The load should be applied gently and at the rate of 600 pounds per minute.

Constancy of Volume

This is one of the most important tests that can be applied and at the same time the most difficult to make. It is important that cement should attain a great strength in a very short period of time, but it is far more important that it should maintain its strength.

Evidences of unsoundness are usually revealed by swelling, checking, cracking, and disintegration; a cement which shows none of these defects is said to be of a constant volume.

Tests of this character are made on pats similar to those used in the determination of the time of setting with the Gilmore wires; these pats are 3 or 4 inches in diameter, one-half inch thick at the centre and taper to a thin edge at the circumference.

As simple as the making of these pats appears, it is quite difficult to make them correctly; often initial strains are produced by trowelling the pat which causes the pat under test to crack, thus giving a false impression of unsoundness. To avoid this trouble it is a good plan after the pat is molded to strike the glass plate several times

on the palm of the hand; this re-arranges the mass, drives the moisture through the mass, thus producing a pat of more uniform density.

The pats should be kept in moist air and should under no circumstances be allowed to dry out; shrinkage cracks result from the drying out of the pats. The pat may leave the glass but this should not necessarily be construed as an evidence of unsoundness.

The immersion of the pat in cold water is the most reliable way to develop evidence of unsoundness,—but as this usually requires several months or years, some form of accelerated test is generally preferred.

The most reliable method is to immerse the pat for three hours, after being preserved for twenty-four hours in moist air in an atmosphere of steam coming from boiling water, contained in a loosely covered vessel. To satisfactorily stand this test the pat should show no signs of checking, cracking or disintegrating.

Cements should not necessarily be condemned on results of this test alone, but it should be sufficient cause to hold the cement for further investigation. The accelerated tests afford a quick check for unsoundness.

Concrete

"We are just on the edge of the great future which concrete has as a building material," says Chief Webster, of the Philadelphia Survey Bureau, as quoted in the "Philadelphia Press," of February 9, 1902.

This remarkable development would have come earlier but for unfortunate experiences with concretes made from natural cements. Because of this experience engineers have proceeded with unusual caution in the use of Portland Cement Concretes. But gradually accumulated experience has dispelled their fears, and to-day we see immense fire-proof buildings, churches, retaining walls, foundations, columns, floors, roofs, partitions, bridges, stairways, culverts, tunnels, sewers, chimneys, docks, drydocks, wharves, vaults, piers, warehouses, factories, aqueducts, etc., standing all over the country, so many tangible and incontrovertible proofs of the practical utility of Portland Cement Concrete construction.

These instances innumerable, the recent construction of a court house entirely of cement, 175 feet by 95 feet by 36 feet high, and of numerous bridges in many parts of the United States, and in a number of foreign countries including Porto Rico, all of concrete, are illustrative of the strength of Chief Webster's assertion, and forcibly recommend the study of concrete construction to the progressive architect, builder and contractor. Stronger and more durable than any natural stone, unaffected by fire or moisture, capable of adaptation to any position or condition, workable by unskilled labor, lending itself easily to any form of ornamentation, and comparatively inexpensive, concrete comes to us as one of the most valuable gifts from modern industrial science. Its extraordinary value in

fire-proof construction has been frequently demonstrated in actual use, but certain tests made on January 15, 1902, under the superintendence of Mr. Howard S. Richards, of Wilson Bros. & Co., Philadelphia, prove it to be, without exception, the most efficient resistant of fire and water yet offered to the building trade.

In this test concrete arches, Composed of one part Vulcanite Portland Cement to two parts sharp Jersey gravel and five parts ordinary boiler cinders, formed the roof of a furnace 11 feet wide, 14 feet 4 inches long, and 9 feet high. The system includes longitudinal I beams, a suspended steel lath and plaster ceiling and supports an ordinary wood floor, of which the 3 inch by four inch sleepers are also imbedded in concrete. A vigorous fire was maintained in this furnace from 10.42 A. M. till 2.03 P. M., combustion being intensified by means of a pressure fan. The water current pyrometer showed 1500 degrees Fahrenheit at 11.35 A. M. 2000 degrees Fahrenheit at 12 o'clock, and after that rose to 2,135 degrees. It is estimated that this latter temperature corresponds to about 2,500 degrees as measured by the usual air-current pyrometer. The heat destroyed the plaster ceiling and centres, but the concrete arches and the beams protected by concrete as well as the wood floor members supported by the arches remained intact. At 2.03 P. M. the furnace door was opened and a stream of water from a $1\frac{1}{8}$ inch fire nozzle, at a pressure of 65 pounds per square inch, was played upon the ceiling and side walls for ten minutes. The concrete remained uninjured, but the furnace walls and chimney proved to be badly cracked and eaten by the intense heat. This test, arranged and conducted in accordance with the instructions from Chief Hill, of the Bureau of Building Inspection and Chief Engineer Clark of the same bureau, both of whom were present throughout, amply demonstrated the superiority of a properly constituted Portland Cement Concrete in fire-proof construction.

But this is incidental; the chief argument in favor of concrete construction lies in its great simplicity and plasticity. It is possible to do with concrete anything that can be done with stone, wood or steel, and generally it will be more cheaply and effectively done with concrete than with either of the other materials.

In a paper presented to the Illinois Society of Engineers and Surveyors by Mr. W. A. Rogers, member of the American Society of Civil Engineers and an

expert in railway construction, he calls attention to the growing use and peculiar adaptability of concrete to railway needs. The railways are at the present time expending large sums in the improvement of their road-beds and station buildings. The rapid increase in weight and capacity of locomotives and cars, and the deterioration in steel bridges, etc., has turned general attention to the superiority of concrete for the construction of bridges, culverts and viaducts, and has led to a great development in this direction. Mr. Rogers notes that "the use of concrete for the ordinary pier and abutment is becoming very common," and "knows of concrete piers and abutments used to support high trestles and long spans in streams where the ice is bad, and in fact, they are used in all ordinary bridge work where stone masonry has been the practice in the past." He regards concrete "as an ideal form of masonry for arch construction. It is especially good for the construction of skew arches, avoiding as it does, the necessity of the cutting of difficult arch stones." He mentions a concrete arch bridge recently completed, composed of eight arches, ranging from 88 to 122 feet, and also a railroad bridge in process of construction, with a number of arches varying in span from 40 to 140 feet. Rail and I beam top culverts of concrete are mentioned as a common form of construction on many railroads, while the cylindrical form of the culvert is also used to a limited extent.

The material is also widely used in railway practice for retaining walls, cinder pits, sewers, foundations, pumping posts, chimneys, and freight house floors, while recently it has been used for the entire walls of depot and shop buildings.

While natural cements are sometimes used for underground concrete construction, and are fairly satisfactory in such situations, they are too susceptible to the action of frost for use above ground, and the difference in cost between these cements and the best Portland Cement is so small that there is no excuse for taking risks.

The uses above cited show the extreme range of adaptability of Portland Cement Concrete. The growth of demand has been very rapid, but production has kept pace with it. The custom prevalent only ten years since of specifying imported Portland Cement for important work has been entirely abandoned, since it is now possible to secure American Portland Cement equal in every respect to the

highest grades of foreign production, while the rapid development and improvement of the domestic industry has resulted in greatly reduced cost to the consumer and consequent increase in demand.

Mr. Rogers sums up his forcible argument in favor of extended use of concrete in the following words :

“ Let us lastly consider some of the reasons which have led to the increasing use of concrete by the railroads; The fact that it can be built with unskilled labor under competent foremen is an important advantage, as also is the ease with which suitable materials may be obtained and the readiness with which it may be moulded in different forms. In the present condition of the steel market, when it takes from eight months to a year to get delivery of steel bridges, concrete arches of long span are being planned and built in places which would ordinarily be crossed on steel girders, because they can be completed long before steel could be furnished. Concrete construction is ordinarily cheaper than stone, and with the present price of materials it will be found that frequently concrete arches may be built for less money than steel on masonry abutments. Properly made, concrete is durable. Concrete is susceptible of such treatment as to present a pleasing appearance, adapting it to various forms of building work. In the case of bridge work, it can be built with less interference with traffic than stone masonry. The writer believes that there is a rapidly growing sentiment in favor of concrete structures that is well merited.”

While the recent development in the use of concrete has been remarkable, everything points to a vastly increased use in the future. Quite recently, Edison, in consequence of some discovery made by himself in the manufacture of cement, is quoted as saying that “ in the very near future all dwellings and all buildings of every sort will be formed of concrete, while stone, brick and other materials now in common use will be entirely discarded.”

And what is to prevent? There are no limits to its use—no bounds to its adaptations. Its manufacture is simplicity itself, so that the ordinary unskilled laborer, by following the easy rules for its preparation may quickly attain to as great proficiency as the most accomplished engineer.

The happy device of introducing iron or steel members or skeleton structures within masses of concrete, thereby enormously increasing the strength of structural parts under tension, has opened a fresh horizon in the use of concrete, and has done much to enlarge its use. This is a practice that dates back only ten years, but the successful experience of Cottancin, Hennebique, and Monier in France, Melan, in Austria and Germany, and Hyatt, Jackson and Ransome in England and America, have demonstrated this to be the rational method of construction, and it has been generally adopted by practical engineers.

The subject of concrete construction and its possibilities is fascinating—it tempts the pen, but space permits only the broad assertion that it is the latest, best and most promising material that has been placed in the hands of the constructor. From the mammoth quarried blocks of Cheops to a mammoth building practically consisting of a single block of concrete is a far cry, but in the two, the past and the future touch hands.

Estimating for Concrete

In estimating for concrete work the cubical volume of the space to be filled determines the amount of coarse material (stone or gravel, etc.,) necessary, that is, the volume of concrete will be practically equal to the volume of coarse material used, the mortar simply filling the voids and not increasing its bulk to any extent.

To decide on the proper proportions for concrete it is, therefore, necessary to determine the voids in the stone or gravel to be used on the work in question. This having been done enough mortar should be added to completely fill the voids and leave a slight excess, as it is impossible to get perfect mixing and tamping in practice.

A first-class mortar can be had by mixing.

1 part Vulcanite Portland Cement.

3 parts Clean, Sharp Sand or Slag Screenings.

This mixture we consider strong enough for any concrete work, as it will be much stronger than the stone which is used as an aggregate.

To this mortar should be added all the stone it will carry, which is determined by the voids. If we assume a stone of uniform size, the voids will be about 40 per cent. In this case, assuming perfect mixing, the volume of mortar can be 40 per cent. of the volume of the stone or the mixture can be 1 part mortar to $2\frac{1}{2}$ stone, therefore, as the mortar is 1 cement to 3 sand, we have 1 cement 3 sand, $7\frac{1}{2}$ stone.

In practice, however, to allow for imperfect mixing and tamping, the mortar should be increased to about 50 per cent. of the volume of stone, giving a 1, 3, 6 mixture.

If the stone is irregular in size, running from say $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches, the voids will approximate $33\frac{1}{3}$ per cent. In this case with perfect mixing the mixture would be 1 cement, 3 sand and 9 stone. Increasing the percentage of mortar to say 40 per cent. to take care of imperfect mixing gives a 1, 3, $7\frac{1}{2}$ mixture, which is amply strong.

We know of work done with "Vulcanite" in which the proportions of 1 cement, 4 sand and from 10 to 14 stone or gravel have been used with success.

Mixing Concrete

The best results in mixing concrete are always obtained by using machinery, but if hand mixing is the only process available, the following method has given excellent results and is to be recommended :

Provide two mixing platforms, one for the cement and the other for stone or gravel. Mix the sand and cement (dry) thoroughly and uniformly together on the platform provided for that purpose, turning the mass over about three times and raking thoroughly with a garden rake during the process of turning, until the mixture of sand and cement shows a uniform color throughout. Then spread the stone or gravel to a uniform depth of about six inches on the second platform. Wet thoroughly and then spread the dry mixture of sand and cement over the bed of wet stone. Finally turn the whole mass over with shovels about three times, raking with a garden rake, as the turning proceeds, to insure thorough incorporation. If it be found that the mixture is not sufficiently wet, add with a sprinkling pot sufficient water to bring the moisture to the surface when the mass is tamped.

The sand used should be *clean and sharp*, and preferably graded in size from fine to coarse grains. The stone should run from $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches. The best stone for concrete is that which crushes with a cubical fracture. Clean gravel can also be used for concrete, but on account of the roundness and smoothness of the pebbles the mortar cannot get the same hold on it that it can on stone.

The dry mixing of the sand and cement should be *very thoroughly* done so that the cement will be distributed uniformly throughout the mortar thus giving it a uniform strength. The same also applies to the mixing of the stone and mortar.

The concrete should be dumped in place, not dropped from a height, as this tends to separate the stone from the mortar. The layers of concrete should not exceed 6 or 8 inches in thickness and should be thoroughly tamped until moisture shows on top.

N o t e s

The conviction that the raw materials cannot be too intimately mixed, is responsible for this company grinding their rock finer than other manufacturers; this fine grinding aids materially in the chemical transposition and subsequent union of the different constituents present in the kiln, thereby enabling the operator to burn a uniform clinker, and thus precluding the possibility of any free or uncombined material showing up in the finished cement.

"Vulcanite" Cement is ground 95 per cent. fine on the No. 100 mesh sieve and 80 per cent of the whole will pass through the No. 200 mesh sieve.

We pack and ship only cement that has been thoroughly "cured" and tested and which is ready for instant use.

The great capacity of our store-houses (300,000 barrels) obviates the necessity for shipping what is known as "green or unhydrated cement."—no matter how great the demand.

Unending attention and care is given to the packing and shipping of "Vulcanite" Portland Cement in order that it may arrive at its destination in as good condition as when it left the factory.

No package of any kind is placed on the cars for shipment until it has been thoroughly inspected and accurately weighed by the competent foreman of the department, and to this scrupulous exactness is due, in a great measure, the success of Vulcanite Portland Cement and its retention of its present commanding position among Portland Cements.

From a chemical standpoint "Vulcanite" must needs be a true Portland Cement in-as-much as it approaches very closely theoretical proportions in the relation of the lime content to the silica and alumina, that is to say, a maximum percentage of lime is maintained at all times as near the theoretical amount as is considered practicable.

It is with much satisfaction that we refer to the appended lists of Railroads, Engineers, Architects, Contractors, and important operations as interesting proofs of the wide use, and general acceptance of "Vulcanite" as the best cement on the market.

A FEW ENGINEERS WHO USE "VULCANITE."

H. C. Allen, Engr.,	Erie Canal, Syracuse, N. Y.
F. M. Ashmead,	Pittsburg, Pa.
Julian Kennedy,	" "
E. K. Morse,	" "
Isaac Battin, Ch. Engr.,	Omaha Gas Co., Omaha, Neb.
Peter A. Edguist,	" "
Andrew Rosewater,	" "
J. B. Reynolds, Ch. Engr.,	Omaha Water Co., " "
W. J. Carter, City Engr.,	Cleveland, Ohio.
Osborn Engineering Co.,	" "
Wellman Seaver Eng. Co.,	" "
E. P. Roberts & Co.,	" "
Coleman & Malochee,	New Orleans, La.
Howard A. Carson, Ch. Engr.,	E. Boston Tunnel, Boston, Mass.
Clark Dillenbeck,	Philadelphia, Pa.
Wm. A. Drysdale,	" "
Geo. M. Newhall, Eng. Co.,	" "
W. S. Twining, Ch. Engr.,	Union Traction Co., Phila., Pa.
Jay M. Whitham, Consulting Engr.,	Phila., Pa.
Geo. S. Webster, City Engr.,	" "
G. F. Greenwood, Ch. Engr.,	Havana Elec. Ry. Co., Havana, Cuba.
B. J. T. Jeup, City Engr.,	Indianapolis, Ind.

Julian Kendrick, City Engr.,
 I. Austin Miller, City Engr.,
 J. W. Maxey,
 Jos. Phillips, City Engr.,
 Geo. H. Pegram, Ch. Engr.,
 M. G. Starrett, Ch. Engr.,
 E. D. Rich, Asst. City Engr.,
 Paul L. Schultz, City Engr.,
 Ritter & Mott,
 Wm. Sooy Smith,
 E. C. & R. M. Shankland,
 Benezette Williams,
 Bascom Sykes, City Engr.,
 H. Von Schon, Ch. Engr.

Birmingham, Ala.
 Houston, Texas.
 " "
 Scranton, Pa.
 Manhattan El. Ry. Co., New York.
 Metropolitan St. Ry. Co., New York.
 Utica, N. Y.
 " "
 Chicago, Ill.
 " "
 " "
 " "
 Norfolk, Va.
 Consolidated Lake Superior Power Co.,
 Sault Ste. Marie, Mich.

RAILROAD ENGINEERS WHO USE "VULCANITE."

J. A. Atwood, Ch. Engr.,
 H. F. Baldwin, Ch. Eng.,
 W. H. Brown, Ch. Engr.,
 Jos. T. Richards, Engr., M. W.,
 J. B. Berry, Ch. Engr.,
 R. L. Huntley, Asst. Engr.,
 W. E. Dauchy, Ch. Engr.,
 J. M. Graham, Ch. Engr.,
 W. W. Gwathmey, Ch. Engr.,
 Wm. Hunter, Ch. Engr.,
 T. H. Johnson, Consulting Eng.
 Thomas Rodd, Ch. Engr.,
 W. K. McFarlin, Ch. Engr.,
 E. H. McHenry, Ch. Engr.,
 J. O. Osgood, Ch. Engr.,
 H. T. Porter, Ch. Engr.,
 W. J. Wilgus, Ch. Engr.,
 D. J. Whittemore, Ch. Engr.,

P. & L. E. R. R.,
 C. & A. R. R.
 Penna. R. R.,
 Penna. R. R.,
 Union Pac. R. R.,
 Union Pac. R. R.,
 C. R. I. & P. R. R.,
 B. & O. R. R.,
 Seaboard Air Line,
 Phila. & Reading R. R.,
 Penna. Co.,
 D. L. & W. R. R.,
 Northern Pac. Ry.,
 C. R. R. of N. J.,
 P. B. & L. E. R. R.,
 N. Y. C. & H. R. R.,
 C. M. & St. P. R. R.,

Pittsburg, Pa.
 Chicago, Ill.
 Phila., Pa.
 Phila., Pa.
 Omaha, Neb.
 Omaha, Neb.
 Chicago, Ill.
 Baltimore, Md.
 Portsmouth, Va.
 Phila., Pa.
 Pittsburg, Pa.
 Hoboken, N. J.
 St. Paul, Minn.
 Jersey City, N. J.
 Pittsburg, Pa.
 New York.
 Chicago, Ill.

A FEW CONTRACTORS AND OTHERS WHO HAVE USED "VULCANITE."

W. A. & A. E. Wells,	Chicago, Ill.	Atlantic Refining Co.,	Philada., Pa.
Angus & Gindle,	" "	S. E. Moore,	" "
Falkenau Construction Co.,	" "	Wm. Krause,	" "
Jonathan Clark & Sons Co.,	" "	Jos. Bechtel,	" "
Thos. Nicholson & Sons Co.,	" "	J. P. P. Lathrop,	" "
R. & S. Sollitt,	" "	Union Traction Co.,	" "
Stamsen & Blome,	" "	E. Boston Tunnel Cons'n Co.,	Boston, Mass.
Hoeffer & Co.,	" "	Thos. J. Hind,	" "
Powell Bros.,	" "	Taylor, Carr & Andrews,	" "
Northwestern Expanded Metal Co.,	" "	Simpson Bros.,	" "
Barber Asphalt Paving Co.,	" "	Bruno, Salamone & Petitti,	" "
James A. Sackley,	" "	L. P. Soule & Son,	" "
The R. F. Conway Co.,	" "	Geo. W. Harvey,	" "
Frank L. Davis Co.,	" "	Frank Batchelder,	" "
Frederick P. Bagley & Co.,	" "	J. B. O'Rourke,	" "
Sherman & Flavin,	" "	Jas. Doherty & Co.,	" "
The Art Marble Co.,	" "	Schailer & Schniglau Co.,	" "
Benezette Williams,	" "	John Waters,	Baltimore, Md.
Garden City Sand Co.,	" "	Thos. J. Walsh,	" "
Messrs. E. D. Smith & Co.,	Philada., Pa.	J. Henry Miller,	" "
" Ryan & Kelly,	" "	C. Sheehan & Son,	" "
" Drake & Stratton Co.,	" "	Henry Smith & Son,	" "
" Geo. A. Fuller Co.,	" "	Filbert Paving & Cons. Co.,	" "
Vulcanite Paving Co.,	" "	Geo. H. Cutting & Co.,	Worcester, Mass.
Messrs. John Goll & Co.,	" "	Geo. W. Carr,	" "
" H. S. Kerbaugh & Co.,	" "	Maguire & Penniman,	Providence, R. I.
" F. M. Harris & Co.,	" "	Horton & Hemenway,	" "
" Melody & Keating,	" "	Alex. Booth,	Newport, R. I.
" Peoples Bros.,	" "	Barber Asphalt Paving Co.,	New Orleans, La.
" Charles A. Sims & Co.,	" "	H. C. Spinks,	" "
" Weand & McDermott,	" "	Louisiana Improvement Co.,	New Orleans, La.
" W. A. & A. E. Wells,	" "	Chas. F. Collom & Co.,	" "
" Lewis Havens Sons,	" "	Chas. J. Babst,	" "
" Geo. F. Payne & Co.,	" "	S. A. Colongne,	" "
Roebling Construction Co.,	" "		
Messrs. Dorsey & Smith,	" "		
United Gas Improvement Co.,	" "		

John Catrano,	New Orleans, La.	S. M. Green,	Pittsburg, Pa.
Geo. A. Robinson,	" "	Booth & Flinn, Ltd.,	" "
Muir & Fromherz,	" "	National Concrete Fire Proofing Co.,	
Darcantel & Drassellisco,	" "		Cleveland, O.
National Contracting Co.,	" "	Clements Bros. Cons. Co.,	" "
Papierre & Poray	" "	Brown Hoisting Mach'ry Co.,	" "
Warren & Montgomery Bros.,		W. J. Gawne,	" "
	Yazoo City, Miss.	John Gill & Sons.,	" "
The New York Roofing Co.,		W. C. Gayer & Co.,	" "
	New York City.	J. H. Libby,	" "
The R. H. Jaffray Co.,	" "	The Commonwealth Roofing Co.,	
Metropolitan St. Ry. Co.,	" "		Newark, N. J.
George A. Fuller Co.,	" "	W. H. Turrell,	" "
Sundstrom & Stratton,	" "	Jos. Sharpe,	Patterson, N. J.
F. D. Hyde;	" "	The Chas. Huhl Art. Stone Co.,	
The Roebling Construc-	" "		Cincinnati, O.
tion Co.,	" "	Hipp & Key,	Houston, Tex.
Columbia Fire Proofing	" "	The Kansas City Stone Sidewalk Co.,	
Co.,	" "		Kansas City, Mo.
Neuchatel Asphalt Co.,	" "	S. L. Foster & Son,	Norfolk, Va.
The Manhattan Elevated	" "	C. J. Sullivan,	Syracuse, N. Y.
R. R. Co.,	" "	Schillinger Bros. Co.,	{ Toledo, O.
The Cranford Paving Co.,			{ Detroit, Mich.
	Washington, D. C.	The Consolidated Lake Superior	
U. S. Navy Yard,	" "	Power Co.,	Sault Ste. Marie, Mich.
Jones & Laughlins, Ltd.,	Pittsburg, Pa.	R. H. Richardson & Son,	Hampton, Va.
The Dravo Contracting		J. E. Donelson,	Birmingham, Ala.
Co.,	" "	Manville & Co.,	" "
The Drake & Stratton Co.,	" "	Geo. W. Winship,	Saratoga, N. Y.
D. F. Keenan,	" "	The Grant Paving Co.,	Omaha, Neb.
Pittsburg Railway Co.,	" "		

A Few of the Architects who specify "Vulcanite"

Alden & Harlowe,	Pittsburg, Pa.	Henry Ives Cobb,	Chicago, Ill.
Beezer Bros.,	" "	Frost & Granger,	" "
Chas. Bickle,	" "	Holabird Roche,	" "
F. J. Oesterling,	" "	Jarvis Hunt,	" "
F. C. Sauers,	" "	Jenney & Mundie,	" "
Edw. Stotz,	" "	E. R. Krause,	" "
V. Wyss Thallman	" "	Louis Lehle,	" "
Geo. Arches,	Baltimore, Md.	Patton & Miller,	" "
Chas. E. Cassel & Son,	" "	Shepley, Rutan & Coolidge,	" "
Hodges & Leach,	" "	G. W. Wagner,	" "
E. D. Preston,	" "	W. E. Brown,	Kansas City, Mo.
Jos. Evans Sperry,	" "	John G. Braecklin,	" "
Douglass H. Thomas, Jr.,	" "	F. E. Hill,	" "
Baldwin & Pennington	" "	Chas. A. Smith,	" "
Andry & Bendoragel, New Orleans, La.		Van Brunt & Howe,	" "
Danneman & Charlton	" "	Cope & Stewardson,	Phila., Pa.
Thos. Sully,	" "	H. D. Dagit,	" "
Toledano & Wogan,	" "	Seymour Davis,	" "
F. S. Barnum & Co.,	Cleveland, O.	Frank Miles Day & Bro.,	" "
J. Milton Dyer,	" "	E. F. Durang,	" "
C. W. Hopkinson,	" "	Furness Evans & Co.,	" "
Lehman & Smidth	" "	G. W. & W. D. Hewitt,	" "
John A. Richardson,	" "	Hales & Ballinger,	" "
Wm. R. Watterson,	" "	Jos. M. Huston,	" "
D. A. Bohlen & Son, Indianapolis, Ind.		Addison Hutton,	" "
S. A. Brubaker & Co.,	" "	Edgar V. Seeler,	" "
Adolph Sherrer,	" "	Horace Trumbauer,	" "
John H. Stem,	" "	Frank R. Watson,	" "
Vonnegut & Bohm,	" "	Wilson Bros. & Co.,	" "
C. A. Wallingford,	" "	Jas. H. & Jno. T. Windrim,	" "
D. H. Burnham & Co.,	Chicago, Ill.	J. Scott Collins,	Scranton, Pa.

James Feeney,	Scranton, Pa.	Bruce Price,	New York.
Arthur H. Bowditch,	New York.	A. V. Porter,	"
Buchman & Fox,	"	R. H. Robertson,	"
Clinton & Russell,	"	F. W. Clarke,	Omaha, Neb.
Henry Ives Cobb,	"	Chas. Cleves,	" "
Jas. M. A. Darrach,	"	Fisher & Lowrie,	" "
De Limos & Cordes,	"	F. A. Hennigher,	" "
Cass Gilbert,	"	T. R. Kimball,	" "
John Du Fais,	"	John Latensen,	" "
H. J. Hardenburgh,	"	Geo. Mason,	Detroit, Mich.
Herts & Tallant,	"	John Scott & Co.,	" "
McKim, Mead & White,	"	A. C. Van Leyen,	" "
Geo. B. Post,	"	J. M. Wood,	" "

A Few Important Buildings and Operations in the Construction of which "Vulcanite" was used.

PHILADELPHIA.

Real Estate Trust Building.
Land Title "
Stephen Girard "
Bell Telephone "
Mariner and Merchant "
National Biscuit Co. Building.
J. P. Mathieu & Co. "
United Gas Improvement Co. Office Building.
Warren Ehret Co., Warehouse.
Merchants Warehouse (Delaware Ave., near Chestnut St.)
Philadelphia & Reading Subway.
Delaware Ave. Improvement Bulkhead Extension.
John B. Stetson & Co. New Building.
United States Mint.
Bellevue-Stratford Hotel.
New Bridges Penna. R. R. Schuylkill River.
and others.

NEW YORK.

Atlantic Trust Co. Building,
J. P. Morgan's Lying-in Hospital,
Commercial Trust Building, Jersey City,
Sub-Stations 2, 3 and 4 Manhattan Elevated
R. R. Co.,
Columbia College Dormitory,

Power House, Car Barns and Track Con-
struction Metropolitan St. Ry. Co.,

Union Club Building,

Cement Paving, Penna. R. R. Station

Jersey City,

Graham Court Building.

Flat Iron Building.

Macy & Co. Department Store.

Maiden Lane and Broadway Building,

Corporation Building,

Century “

Sacks “

Battery Place “

Concrete Foundations for Asphalt Pavement 5th Ave.

Bank of Metropolis,

Amsterdam Theatre,

Bayard Building,

Butterick Building,

Bank of State of New York,

No. 42 Broadway,

Orient Building,

and others.

CHICAGO, ILL.

Car Barns Union Traction Co., Roof of Concrete and Expanded Metal.

Le Moyne Warehouse.

Combination Curb and Gutter, Lincoln Park.

New Barn, South Park.

P. H. Rice Malting Co., New Malt House.

Northwestern Elevated R. R. Power House, Bldg. and concrete Engine Foundations.

Lehman Flat Building.

City of Chicago Pumping Stations.

Union Stock Yards.

WASHINGTON, D. C.

Experimental Model Basin, Navy Yard.

Warehouses and Freight Sheds, Union Trust and Storage Co.

Concrete Floors, U. S. Treasury Building.

Concrete Roof, Supreme Court Rooms U. S. Capitol.

Addition to U. S. Electric Lighting Co. Plant.

Concrete Bridge, Rock Creek Park.

Standard Butterine Co., Langdon, D. C.

Ohio Hall of Government, American University.
Carnegie Library.
Concrete Tunnel, Interior Department to Old Post Office Building.

BALTIMORE, MD.

Maryland Telephone Building.
Continental Trust Building.
United Railway Car Barns.
Power Building.
Ka Ka "
Levy "
Maryland Penitentiary.
Carrollton Hotel (repairs).

NEW ORLEANS, LA.

Southern Express Co. Building.
St. Charles Theatre.
New Orleans Power House.
Macheca Building.
New Drainage Canals.

BOSTON, MASS.

East Boston Tunnel, Largest concrete tunnel in the world.
Massachusetts Metropolitan High Level Sewer, 3 Sections.
City of Boston Sidewalk Coustruction.

PITTSBURG, PA.

Bridges P. B. & L. E. R. R. Allegheny & Monongahela Rivers.
Union Station and other improvements Penna. R. R.
Jones & Laughlins Ltd.
Power House Consolidated Traction Co.
Track Elevation Penna. Co., Allegheny, Pa.
Improvements on P. V. & C. R. R., Ormsby and Vicinity.

CLEVELAND, O.

Cleveland Water Works, Pumping Station.
Intercepting Sewer.
Walworth Run Sewer.
Brown Hoisting Machinery Co. Building.

M. A. Bradley Building.
 National Carbon Co. Building.
 N. O. Stone Building.
 Wellman-Seaver Morgan Eng. Co. Building.
 Dollar Saving Bank, Youngstown, O., Concrete Fire Proofing.
 Card Power Building, Cleveland, " " "

OMAHA, NEB.

Cement Sidewalk, U. S. Army Building.
 Metz Bros. Brewery.
 Kingman Implement Co. Building.
 Union Passenger Station.
 Residence and Stable; Geo. A. Joslyn.

New Moerlein Brewery,
 New Jersey State Reformatory,
 New Concrete Bridge to Goat Island,
 New Plant Consolidated Lake Superior
 Power Co.,

Cambria Steel Co.,
 Residence H. A. Berwind,
 " E. J. Berwind,

Concrete Bridge Residence P. D. Armour, Jr., Oconomowoc, Wis.
 Chicago & Alton R. R. Bridge,
 Plants United Coke & Gas Co.,

Armory Building,
 New York Ship Building Co.,
 South Jersey Gas, Electric & Traction Co.,
 Pennsylvania R. R. Station,
 U. S. Sugar Refinery,
 Cement Sidewalks, N. Y. State Capital,

Cincinnati, O.
 Rahway, N. J.
 Niagara Falls, N. Y.

Sault Ste. Marie, Mich.
 Johnstown, Pa.
 Newport, R. I.
 " "

Glasgow Mo., New Concrete Piers.
 Trenton, N. J.
 Camden, N. J.
 Sparrows Point, Md.
 Sharon, Pa.
 Camden, N. J.

" "
 " "
 " "
 " "

Albany, N. Y.

The following Testimonials and Expressions of Appreciation referring to Vulcanite Portland Cement

are invaluable to us, emanating as they do from men who are eminent authorities in their various professions:

THE CRANFORD PAVING CO., (INCORPORATED)
General Contractors.

WASHINGTON, D. C.

“During the past five years we handled thousands of barrels of Vulcanite Portland Cement, the most of which was used by us on our work in the District of Columbia, while considerable was sold to private parties and the District and U. S. Governments.

“We have laid thousands of yards of cement sidewalks in the city of Washington, using ‘Vulcanite’ with most satisfactory results, and have used and furnished it for all classes of paving, foundations, floors, bridge work, etc., and the work done with it has always been entirely satisfactory.

“Vulcanite Portland Cement has passed all the required tests, and is accepted by the U. S. and District Governments and the leading engineers and architects of this city as a first-class Portland Cement in every respect. We have every confidence in ‘Vulcanite’ and cheerfully recommend it to anyone requiring a good cement for first-class work.”

THE VULCANITE PAVING COMPANY,
General Contractors for all kinds of Pavements.

PHILADELPHIA, PA.

VULCANITE PORTLAND CEMENT CO.

Gentlemen:

We are in receipt of your favor of even date, asking if we consider the “Vulcanite” brand of American Portland Cement well adapted for use in the construction of sidewalks, and

if we find the surface of these walks different from those laid with the best brands of German cement.

In reply, we take pleasure in stating that we not only find the "Vulcanite" brand well adapted for our sidewalk work, but experience has shown us that it is the best and most economical cement we have ever used. For the past two years our granolithic sidewalks and curbs have been constructed entirely of this brand of cement, and the result is exceedingly satisfactory in every respect; the work is not only durable, but handsome; the surface shows greater resistance to wear, and remains smooth and hard.

Where other cements have been used, we have noticed a tendency to wear rough, in fact, an actual grinding away of the surface; this does not occur in pavements in which "Vulcanite" Cement has been used. We attribute this to the fact that your cement is ground finer than other brands, and that your clinker is burned harder.

We shall be glad at any time to show any of your customers work done by this company with "Vulcanite."

Yours truly,

(Signed) L. S. FILBERT, President.

Dr. Filbert's forty years experience in the paving business, and his generally conceded standing as an expert, make further comment superfluous.

THE STOWE-FULLER COMPANY.

CLEVELAND, O.

"Vulcanite Portland Cement has always passed all the tests of our city and government inspection, and we have yet to learn of a single lot wherein it has failed."

THE GARDEN CITY SAND CO.,
Security Building.

CHICAGO, ILL.

"We do not believe there is a more even or more carefully manufactured cement than 'Vulcanite Portland' made anywhere."

WM. SOOY SMITH
Civil Engineer and Contractor.

Inspector of Cements
U. S. Gov. Bldg.

CHICAGO, ILL.

"The fineness and color of Vulcanite Portland Cement, its excellent setting action and its great strength entitle it to a permanent place in the front rank of portland cements whether domestic or imported."

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CCA

Laboratory

BURO OF SURVEYS, PHILADELPHIA, PA.

Tests—Made during the Year 1900

ULTIMATE TENSILE STRENGTH IN POUNDS PER SQUARE INCH																REMARKS
NEAT								1 TO 3 STANDARD QUARTZ SAND								
*	24 Hours	7 Days	28 Days	2 Mos.	3 Mos.	4 Mos.	6 Mos.	24 Hours	7 Days	28 Days	2 Mos.	3 Mos.	4 Mos.	6 Mos.		
0.3	6.9	454	777	805	. . .	832	. . .	781	83	261	329	. . .	324	. . .	314	American
0.1	2.1	455	710	792	811	837	847	849	74	195	280	311	326	338	349	American
0.7	7.1	534	716	742	725	709	. . .	. . .	105	261	334	318	329	. . .	. . .	American
0.9	7.7	530	684	734	. . .	731	. . .	756	114	222	296	. . .	336	. . .	344	American
0.2	5.9	419	725	791	801	814	801	779	89	246	311	319	321	309	314	American
0.5	4.7	452	751	871	. . .	836	. . .	872	82	233	332	. . .	326	. . .	336	American
0.3	3.1	384	679	798	815	836	. . .	846	80	205	286	321	308	. . .	317	American
0.6	5.7	366	750	804	819	831	843	842	79	251	321	348	347	340	358	American

G. S. WEBSTER, CHIEF ENGINEER
W. PURVIS TAYLOR, ENGINEER IN CHARGE

Testing La

DEPARTMENT OF PUBLIC WORKS—BURI

Average Results of Portland Cement

BRAND	NUMBER OF SAMPLES		NUMBER OF BRIQUETTES		FINENESS IN PER CENT.			Specific Gravity	SETTING		
									TIME IN MINUTES		TEMPERA
	Collect	Reject	Moulded	Broken	No. 50	No. 100	No. 200		Initial	Hard	Air
Alpha.	8	. . .	128	128	99.3	90.0	75.8	3.137	65.8	332.4	80.9—83.
Atlas	37	. . .	588	588	99.3	89.8	76.4	3.100	53.4	351.2	75.6—77.
†Bonneville Star	17	1	228	212	99.7	90.3	72.7	3.139	56.7	336.7	76.0—76.
Dragon	26	. . .	392	392	99.4	90.8	76.1	3.109	55.0	306.4	79.5—81.
†Giant	86	2	1,324	1,312	98.9	88.4	74.2	3.134	51.4	337.3	78.9—80.
Lehigh	5	. . .	80	80	99.6	89.8	75.4	3.143	157.5	437.5	88.5—89.
†Saylor's	65	3	976	972	99.9	93.1	78.2	3.119	79.2	394.9	78.3—79.
Vulcanite	38	. . .	544	512	99.5	90.2	76.2	3.111	69.8	369.4	76.2—77.

† Average of accepted cement.
Rise in temperature of paste during setting.

Testing La

DEPARTMENT OF PUBLIC WORKS—BUR

Average Results of Portland Cement

BRAND	NUMBER OF SAMPLES		NUMBER OF BRIQUETTES		FINENESS IN PER CENT.			Specific Gravity	SETTING		
									TIME IN MINUTES		TEMPER
	Collect	Reject	Moulded	Broken	No. 50	No. 100	No. 200		Initial	Hard	Air
Alpha.	8	. . .	128	128	99.3	90.0	75.8	3.137	65.8	332.4	80.9—83
Atlas	37	. . .	588	588	99.3	89.8	76.4	3.100	53.4	351.2	75.6—77
†Bonneville Star	17	1	228	212	99.7	90.3	72.7	3.139	56.7	336.7	76.0—76
Dragon	26	. . .	392	392	99.4	90.8	76.1	3.109	55.0	306.4	79.5—81
†Giant	86	2	1,324	1,312	98.9	88.4	74.2	3.134	51.4	337.3	78.9—80
Lehigh	5	. . .	80	80	99.6	89.8	75.4	3.143	157.5	437.5	88.5—89
†Saylor's	65	3	976	972	99.9	93.1	78.2	3.119	79.2	394.9	78.3—79
Vulcanite	38	. . .	544	512	99.5	90.2	76.2	3.111	69.8	369.4	76.2—77

† Average of accepted cement.
Rise in temperature of paste during setting.

Laboratory

BURO OF SURVEYS, PHILADELPHIA, PA.

Tests—Made during the Year 1900

	ULTIMATE TENSILE STRENGTH IN POUNDS PER SQUARE INCH														REMARKS
	NEAT							1 TO 3 STANDARD QUARTZ SAND							
*	24 Hours	7 Days	28 Days	2 Mos.	3 Mos.	4 Mos.	6 Mos.	24 Hours	7 Days	28 Days	2 Mos.	3 Mos.	4 Mos.	6 Mos.	
6.9	454	777	805	. . .	832	. . .	781	83	261	329	. . .	324	. . .	314	American
2.1	455	710	792	811	837	847	849	74	195	280	311	326	338	349	American
7.1	534	716	742	725	709	. . .	. . .	105	261	334	318	329	. . .	. . .	American
7.7	530	684	734	. . .	731	. . .	756	114	222	296	. . .	336	. . .	344	American
5.9	419	725	791	801	814	801	779	89	246	311	319	321	309	314	American
4.7	452	751	871	. . .	836	. . .	872	82	233	332	. . .	326	. . .	336	American
3.1	384	679	798	815	836	. . .	846	80	205	286	321	308	. . .	317	American
5.7	366	750	804	819	831	843	842	79	251	321	348	347	340	358	American

G. S. WEBSTER, CHIEF ENGINEER
W. PURVIS TAYLOR, ENGINEER IN CHARGE

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CCA

B. J. T. JEUP
C. City Engineer, Indianapolis, Ind.

INDIANAPOLIS, IND.

“Vulcanite is one of the very best, and in my judgement the equal of any American Portland Cement.”

HORACE TRUMBAUER
Architect.

PHILADELPHIA, PA.

“For several years past I have used large quantities of the Vulcanite Cement in my most important work, and from the uniformly satisfactory results obtained, have no hesitation in saying that I believe Vulcanite to be the best portland cement in the market.”

WILSON BROTHERS & CO.
Architects and Consulting Engineers.

PHILADELPHIA, PA.

“We have used Vulcanite Cement in some of our most important work and have found it eminently satisfactory.”

JAMES H. WINDRIM,
Architect.

PHILADELPHIA, PA.

“Quite a large quantity of Vulcanite Cement has been used on work in my charge. It has proved very satisfactory, and is always uniform in its tests.”

HALES & BALLINGER.

PHILADELPHIA, PA.

“We have used about 2500 barrels of Vulcanite Cement in twenty-five different buildings, both in water and in dry places, and have always found it entirely satisfactory.”

G. W. & W. D. HEWITT.

PHILADELPHIA, PA.

“We have used Vulcanite Portland Cement in several of the large buildings and find it very satisfactory.”

FRANK R. WATSON,
Architect.

“I have used quantities of ‘Vulcanite’ Cement, and find it entirely satisfactory.”

THE COMMISSIONERS OF LINCOLN PARK.

PAUL REDIESKE, Superintendent.

CHICAGO, ILL.

“I find Vulcanite Portland Cement to stand all tests the best.”

PAUL REDIESKE, Supt.

BENEZETTE WILLIAMS,
Contractor,

CHICAGO, ILL.

“Vulcanite Cement has given entire satisfaction and has withstood the Sanitary District inspection giving, as I am informed, very high results as to tensile strength and fineness.”

S. L. FOSTER & SON
Contractors for
Artificial Stone, Pavements and Sidewalks.

NORFOLK, VA.

“We prefer ‘Vulcanite’ to ‘Dyckerhoff,’ ‘Alsens,’ or any other imported cement that we have ever used.”

THE KANSAS CITY STONE SIDEWALK CO.

KANSAS CITY, MO.

“ We constructed 150,000 square feet of sidewalk, and about 5000 lineal feet of combined curb and gutter with ‘Vulcanite’ last season and do not hesitate to say that the work was equal in every particular to any ever before done by us.

We feel we could pay no higher compliment to ‘Vulcanite’ than the above statement for the reason that we have constructed over two million feet of Granitoid during the past few years and have always used the best brands of imported cements heretofore.

COMMONWEALTH ROOFING CO.

Contractors.

Roofing, Paving, Asphalt Work.

New York, Newark, Jersey City, Hoboken.

NEWARK, N. J.

“ About three years ago we placed our first order with you as a trial order, having strong prejudice against any brand of American cements. We were so pleased with the trial order that soon after we adopted your cement for most of our work, and are free to confess after a thorough test in the practical department of our work, under all conditions, we have found ‘Vulcanite’ to be the best brand of cement we have used during the past ten years, it has never failed us in a single instance where the cement had a fair show. Having used about 10,000 barrels last year we are strong in our convictions that ‘Vulcanite’ is the best cement in the market to-day for all purposes.”

NATIONAL CONCRETE FIRE-PROOFING CO.

CLEVELAND, O.

We have used Vulcanite Portland Cement in our fire-proof floors, in the following buildings, and it has given perfect satisfaction :

Card Power Building, Kingmore Office Building, Cleveland Electric Illuminating Building, Worthington Warehouse, Cleveland Telephone Building, Cuyahoga Telephone Building, Standard Baking Co. Building, Osborn Office Building, Wells Office Building (Youngstown, O.,) Continental Sugar Co. Buildings (Tremont, O.)

EDWIN K. MORSE,
Civil Engineer.

PITTSBURG, PA.

“I have used several hundred thousand barrels of Vulcanite Cement, tested nearly all of it in car load lots and have never had occasion to condemn a single batch, and universally had excellent results.”

CONSOLIDATED POWER COMPANY.

SAULT STE. MARIE, MICH.

My experience with the Vulcanite Portland Cement used in these works, about 100,000 barrels, has been entirely satisfactory.

(Signed) H. VON SCHON, Chief Engineer.

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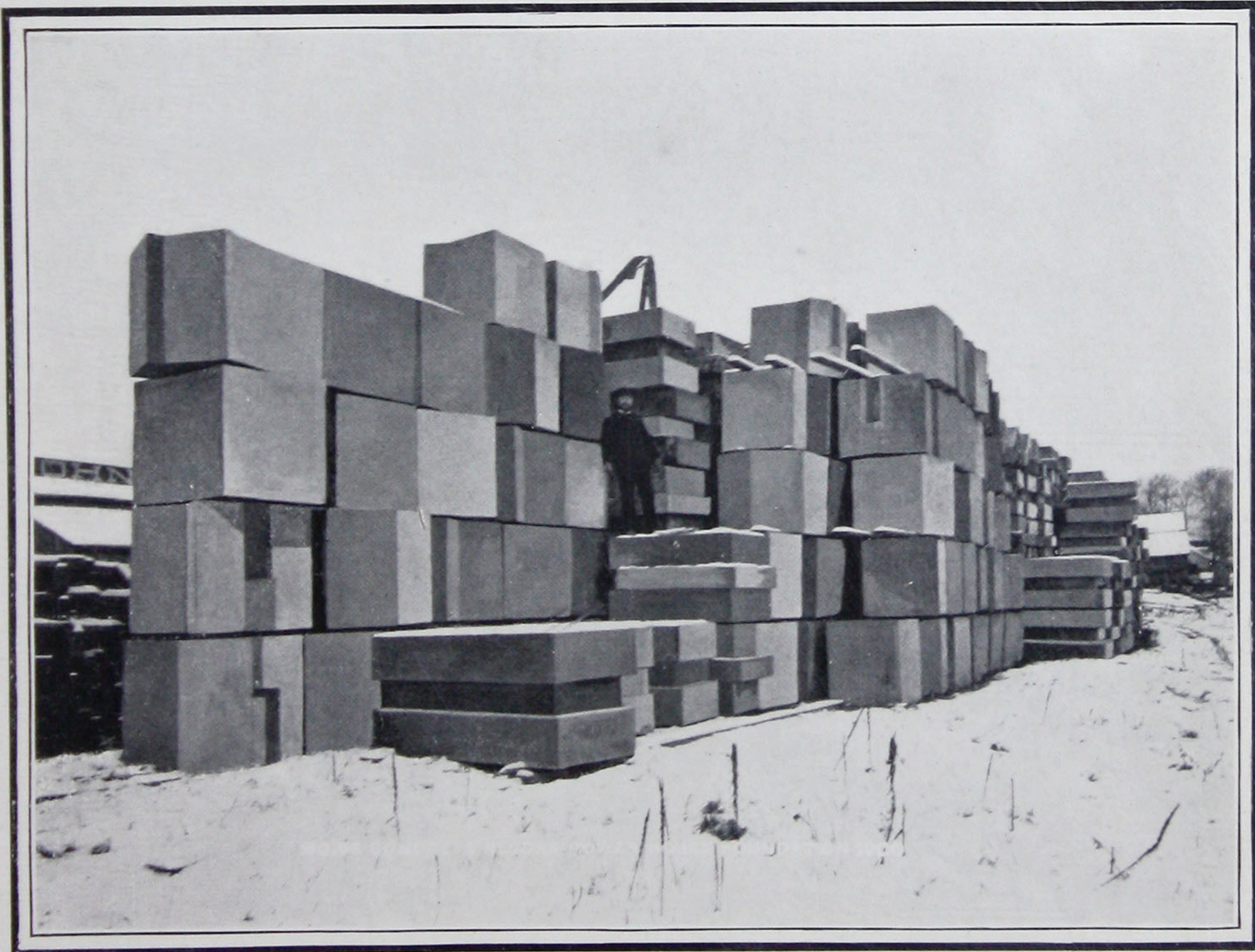


CCA

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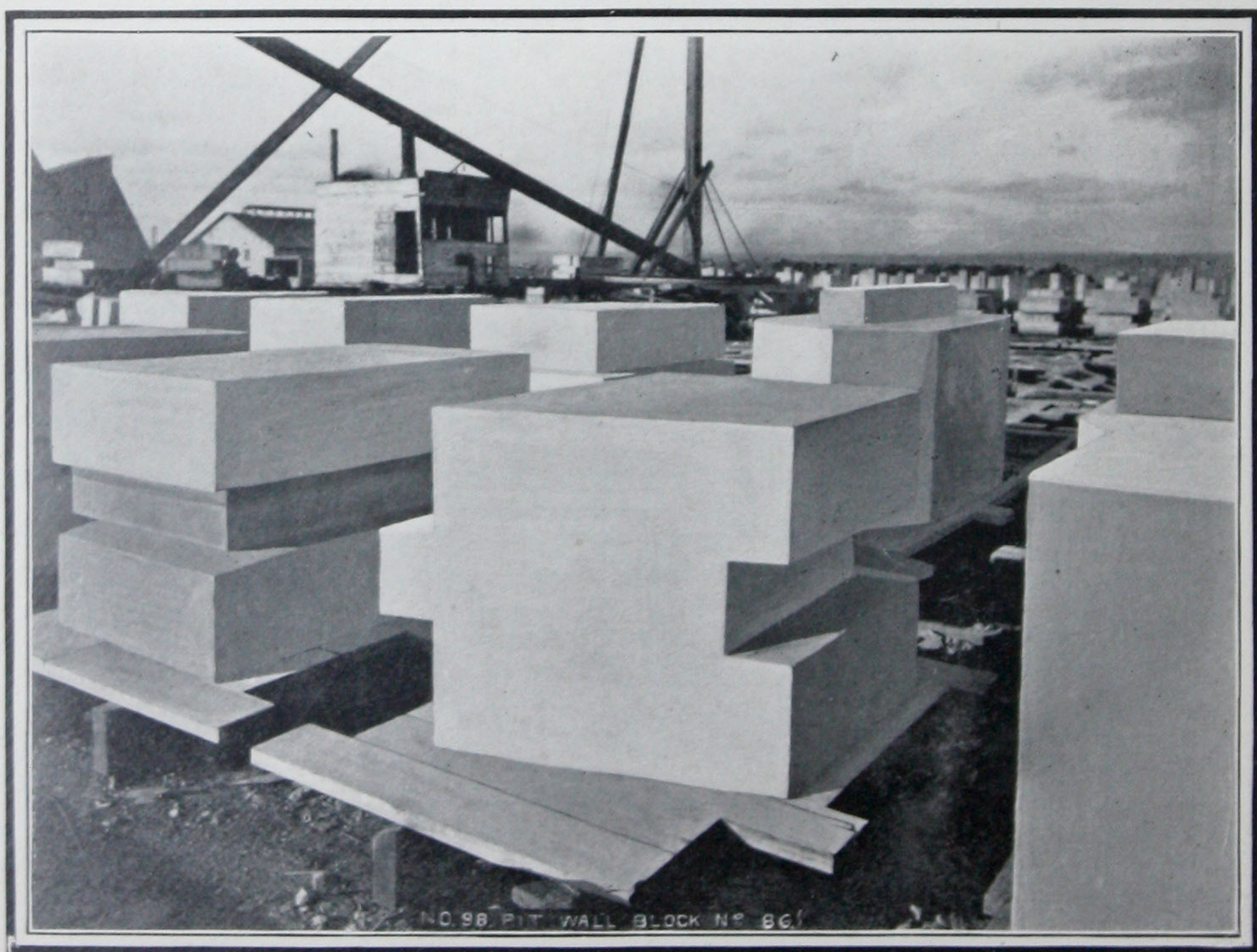
CCA



CONCRETE BLOCKS—POWER HOUSE FOUNDATION
Consolidated Lake Superior Power Co.
Sault St. Marie, Mich.

96,000 bbls. Vulcanite Portland Cement used

H. Von Schon, Engineer in charge

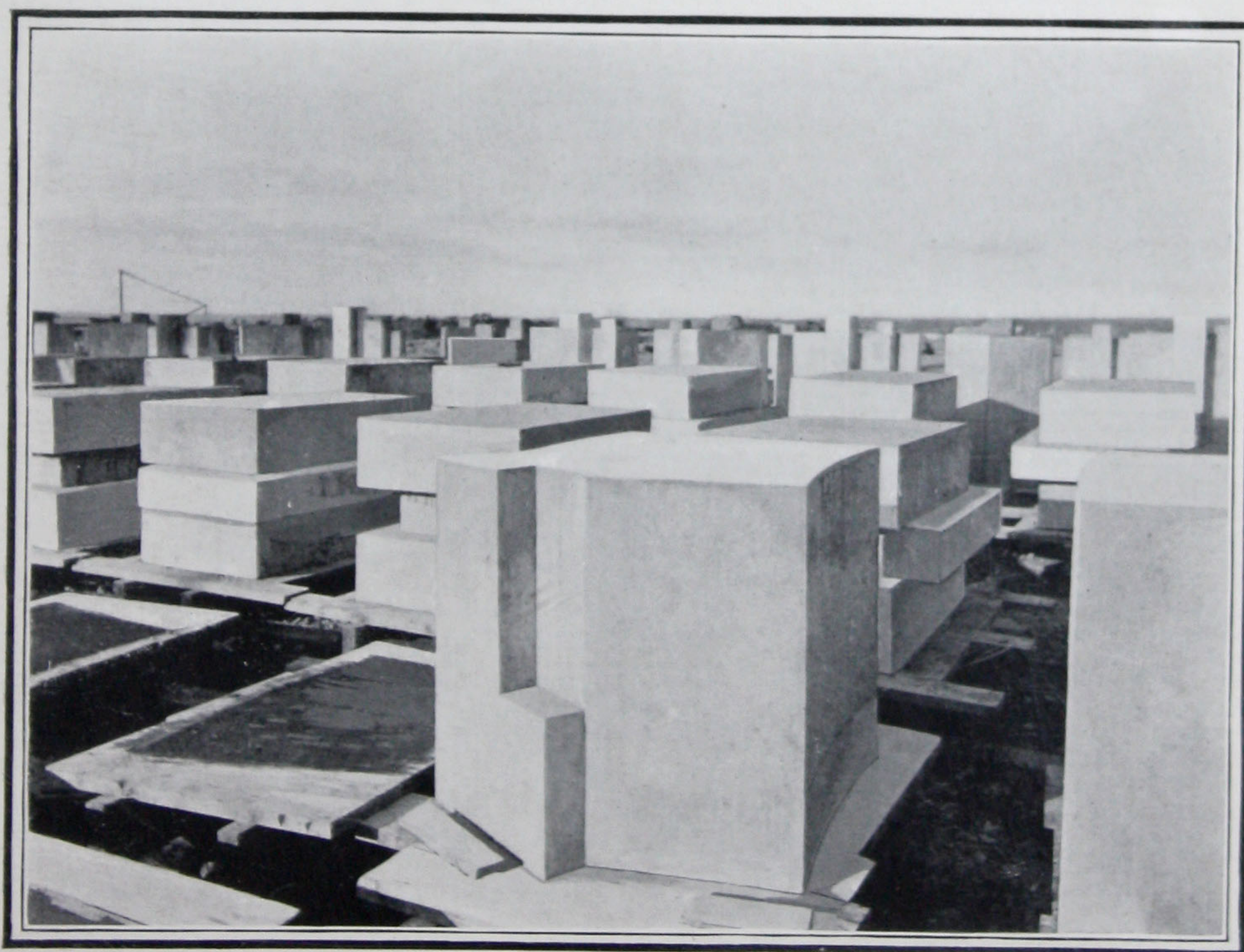


PIT WALL BLOCK No. 86

Consolidated Lake Superior Power Co., Sault St. Marie, Mich.

96,000 bbls. Vulcanite Portland Cement used

H. Von Schon, Engineer in charge



FORE-BAY BLOCK NO. 30
Consolidated Lake Superior Power Co., Sault St. Marie, Mich.

96,000 bbls. Vulcanite Portland Cement used

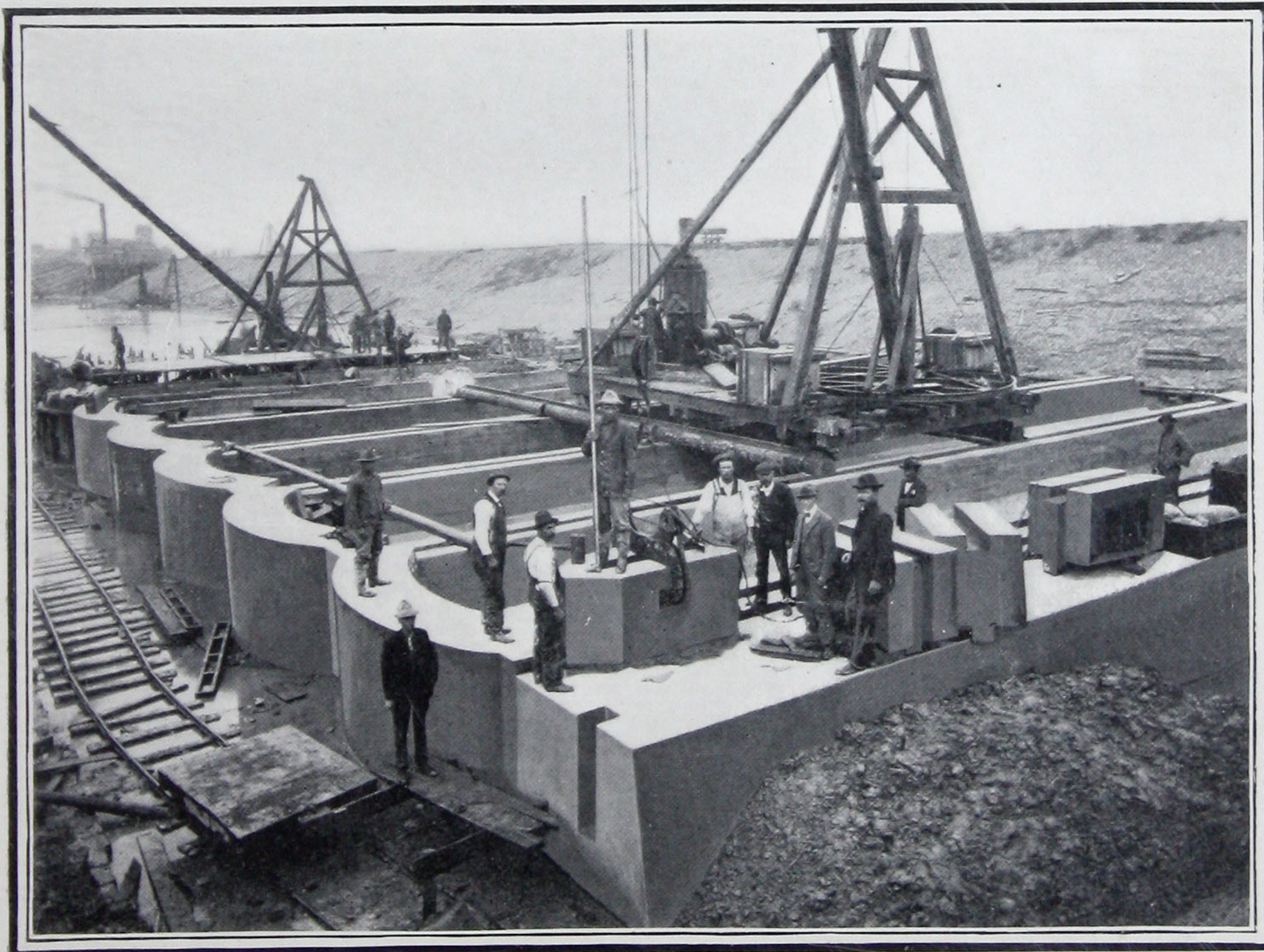
H. Von Schon, Engineer in charge



POWER HOUSE PIT WALLS AT EAST END
Consolidated Lake Superior Power Co , Sault St. Marie, Mich.

96,000 bbls. Vulcanite Portland Cement used

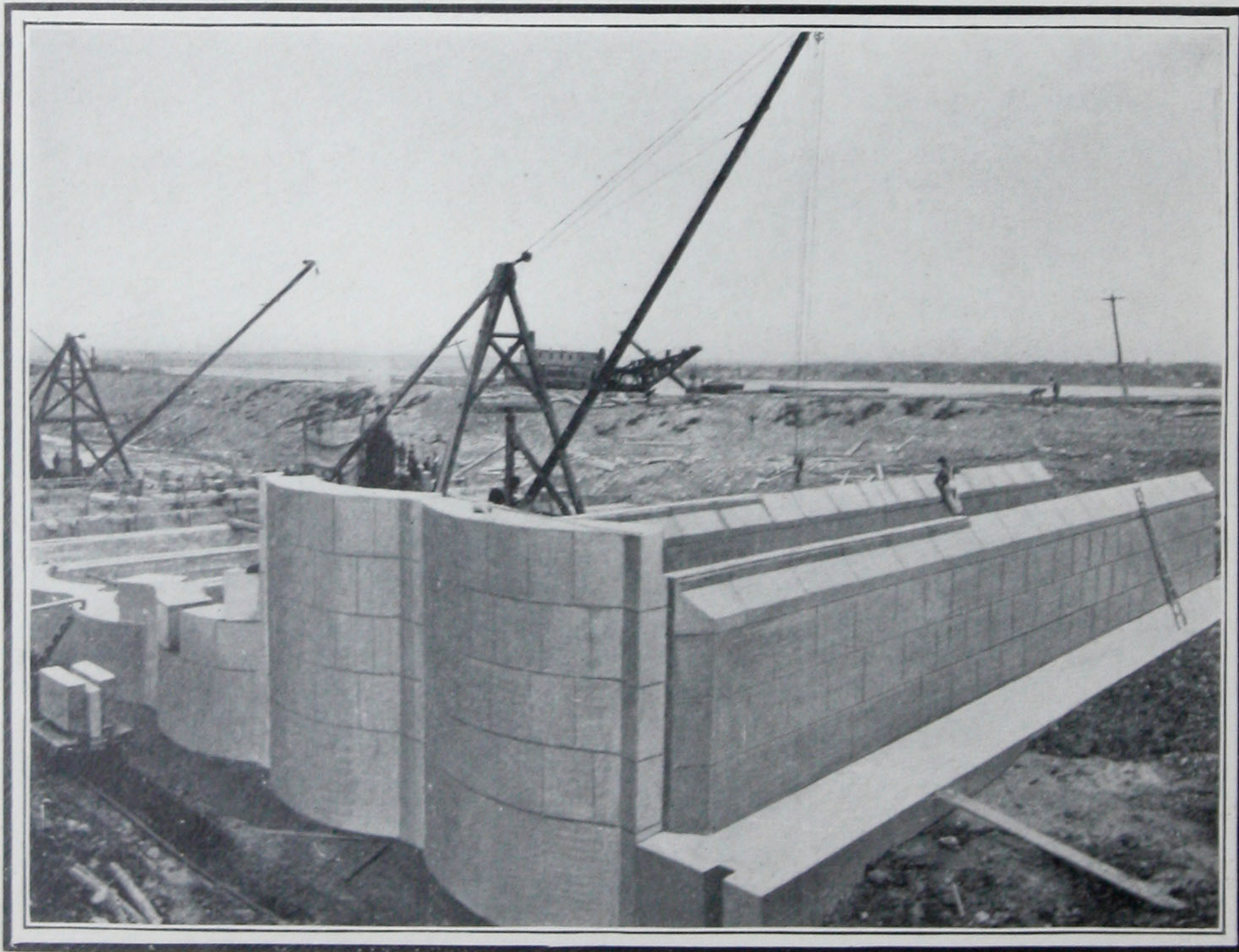
H. Von Schon, Engineer in charge



LAYING CORNER STONE OF POWER HOUSE
Consolidated Lake Superior Power Co., Sault St. Marie, Mich.

96,000 bbls. Vulcanite Portland Cement used

H. Von Schon, Engineer in charge



CONCRETE BLOCK CONSTRUCTION IN PIT WALLS
Consolidated Lake Superior Power Company, Sault St. Marie, Mich.

96,000 bbls. Vulcanite Portland Cement used

H. Von Schon, Engineer in charge



PIT WALLS AT EAST END OF POWER HOUSE
Consolidated Lake Superior Power Co.
Sault St. Marie, Mich.

96,000 bbls. Vulcanite Portland Cement used

A. Von Schon, Engineer in charge



PIT WALLS—as seen near to Consolidated Lake Superior Power Co.
Sault St. Marie, Mich.

96,000 bbls. Vulcanite Portland Cement used

H. Von Schon, Engineer in charge



FIFTH AVENUE (Looking South) NEW YORK

Showing Asphalt Pavement, foundation for which was constructed of
Vulcanite Portland Cement



STORE OF R. H. MACY, HERALD SQUARE, NEW YORK

Architects, De Lemos & Cordes

Vulcanite Portland Cement used



THE "FLAT IRON" BUILDING

Broadway, Fifth Ave., and Twenty-third St., New York

Architects, D. H. Burnham & Co.

Vulcanite Portland Cement used

Geo. A. Fuller & Co., Contractors



ASTOR APARTMENT HOUSE
116th and 117th Street and 7th Avenue, New York

Architects, Clinton & Russel

Contractors, R. H. Jaffray Co.

Curb, Walks and Fountain are Vulcanite Portland Cement; one of the finest pieces
of finished work laid in New York



BROADWAY—MAIDEN LANE BUILDING
New York

Architects, Clinton & Russell

Builders, George A. Fuller Co.



WORK OF THE BOSTON TRANSIT COMMISSION
Section A of the East Boston Tunnel, covering over portion of incline in Maverick Square
20000 Barrels Vulcanite Portland Cement used
National Contracting Co., Contractors



WORK OF THE BOSTON, MASS., TRANSIT COMMISSION
Section A of the East Boston Tunnel, view at incline in Maverick Square
20000 Barrels Vulcanite Portland Cement used
National Contracting Co., Contractors



WORK OF THE BOSTON TRANSIT COMMISSION
Section A of East Boston Tunnel, flattened arch near Sumner Street
20000 Barrels Vulcanite Portland Cement used
National Contracting Co., Contractors

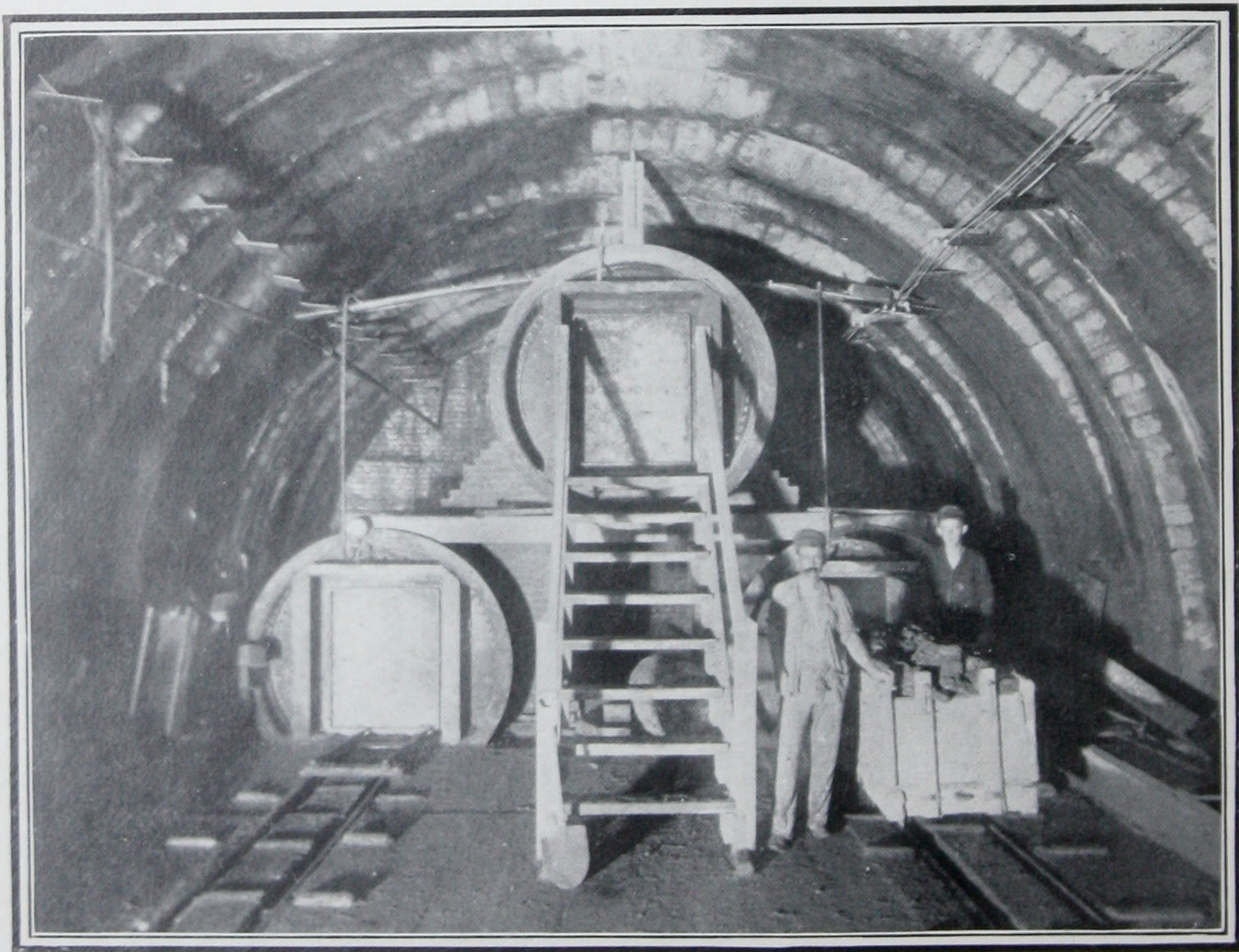


WORK OF THE BOSTON, MASS., TRANSIT COMMISSION

Section A of the East-Boston Tunnel, Concrete and Centering, Lewis Street near Webster Street

20,000 Barrels Vulcanite Portland Cement used

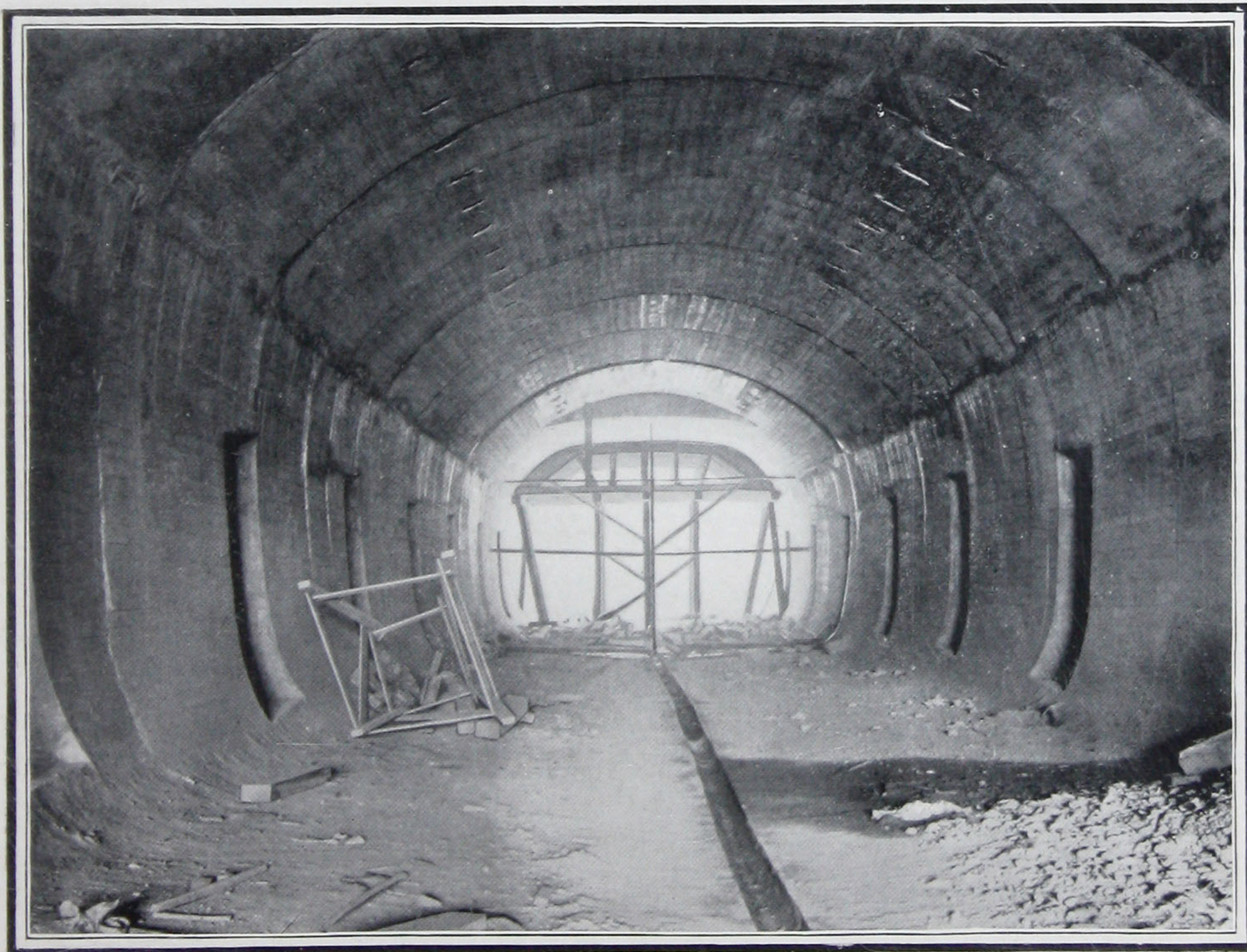
National Contracting Co., Contractors



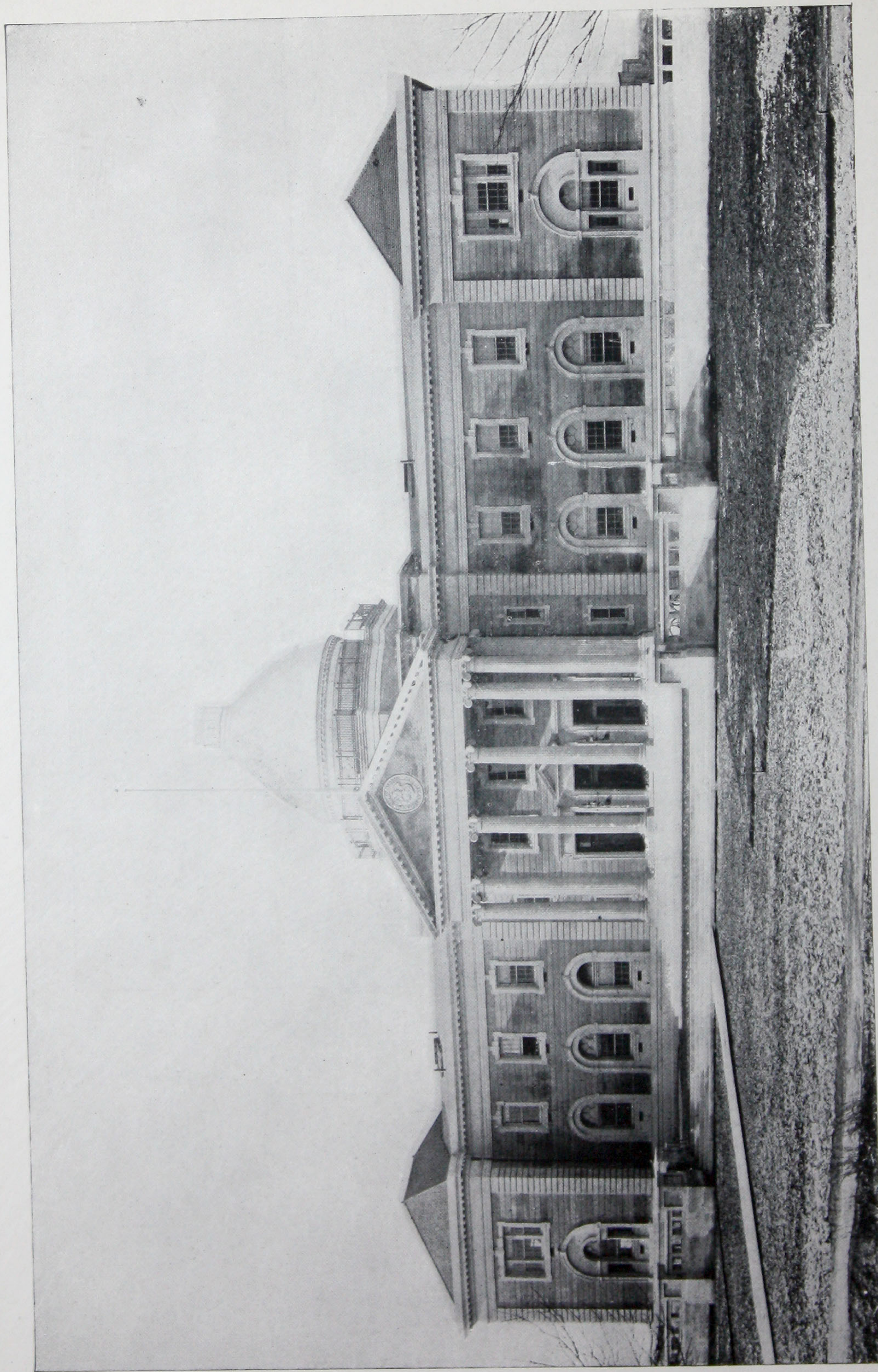
WORK OF THE BOSTON, MASS., TRANSIT COMMISSION
Section B of the East Boston Tunnel, outside (free air side) of air locks

150,000 Barrels Vulcanite Portland Cement to be used

E. Boston Tunnel Construction Co., Contractors



WORK OF THE BOSTON TRANSIT COMMISSION
Section A of the East Boston Tunnel—interior view under Maverick Square
150,000 Barrels Vulcanite Portland Cement to be used
E. Boston Tunnel Construction Co., Contractors



NASSAU COUNTY COURT HOUSE, MINEOLA, L. I.
Entirely of Cement Concrete

Contractor, E. Roche

Architects, W. B. Tabby & Bro.



BANK OF THE METROPOLIS, NEW YORK

Architect, Bruce Price

Contractors, George A. Fuller Co.

Vulcanite Portland Cement used exclusively for foundations and superstructure



CONCRETE BRIDGE SPANNING THE QUEBRADA HOUDA
Between Manati and Cialis, Porto Rico

Designed and constructed by Albert W. Buel, C. E., in charge of the Division of Design of the Board of
Public Works, United States Military Government



YALE COLLEGE FRATERNITY HOUSE
New Haven, Conn.

Aberthaw Construction Co., Boston, Mass.

Entirely of Vulcanite Portland Cement



UNION STATION, P. R. R., PITTSBURGH, PA.

All granolithic sidewalks, flooring, water-proofing and foundations Vulcanite Portland Cement used

D. H. Burnham & Co., Architects, Chicago

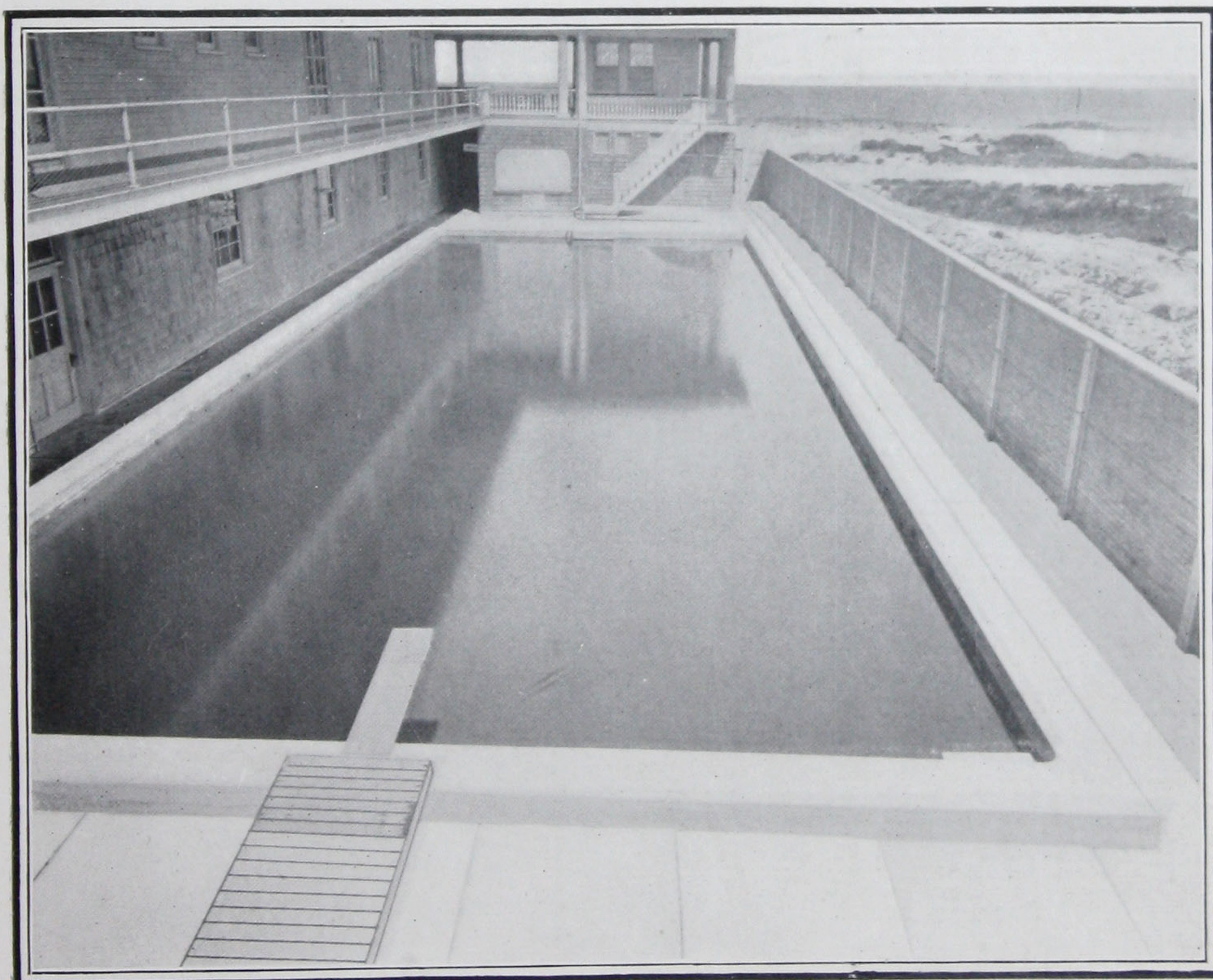
Wm. H. Brown, Chief Engineer

A. N. Hazlitt, Superintendent of Construction

Roydhouse, Arey & Co., and Miller Bros., Builders

H. S. Kerbaugh, Contractors

Vulcanite Paving Co.,



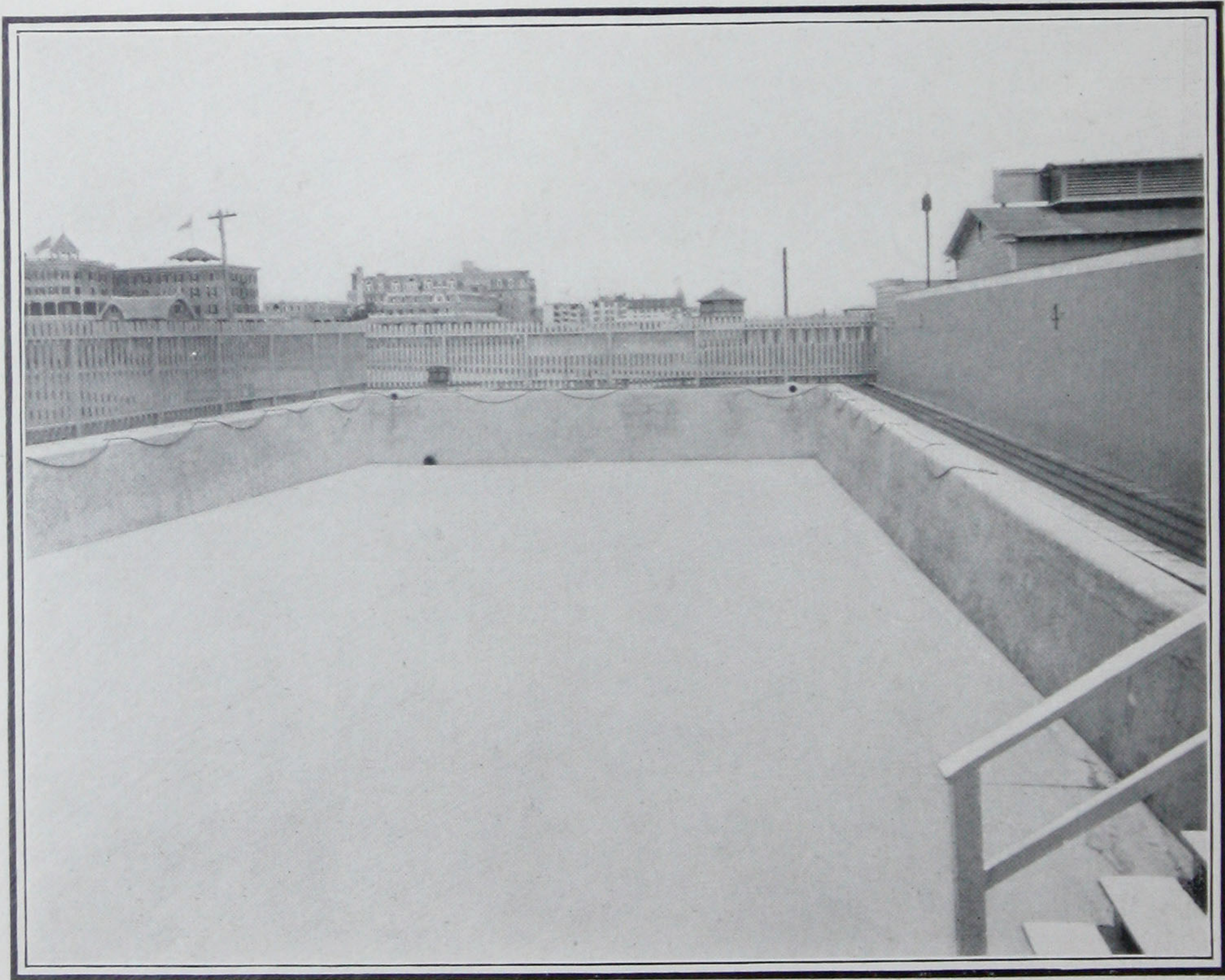
SWIMMING POOL, SPRING LAKE CASINO, N. J.

Vulcanite Portland Cement used

Horace Trumbauer, Architect

Vulcanite Paving Co., Contractors

Geo. F. Payne & Co., Builders



SWIMMING POOL, OCEAN GROVE, N. J.
Built for the Ross Estate

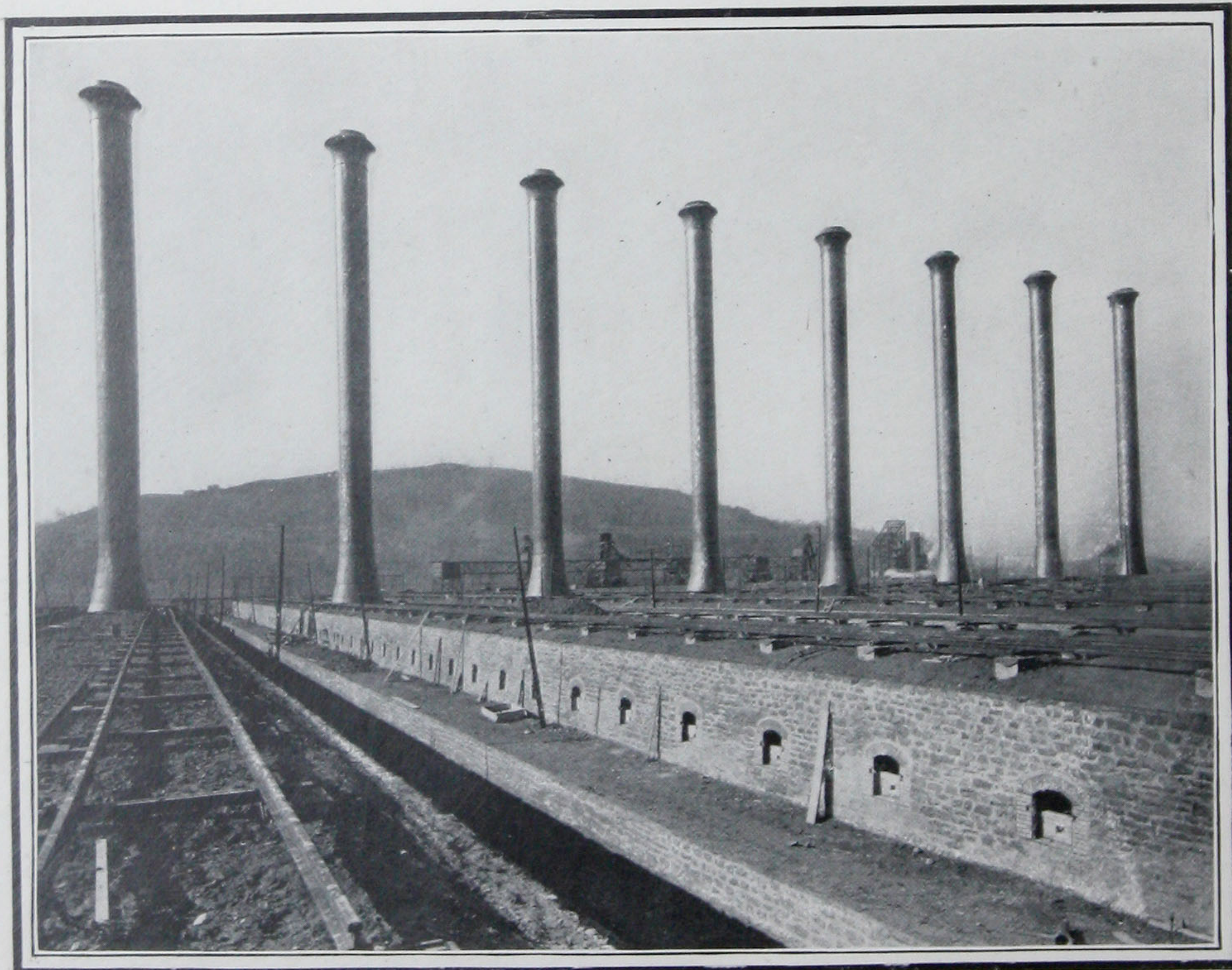
Vulcanite Portland Cement used
Vulcanite Paving Co., Contractors



CAPITOL AT ALBANY

Curbs, granolithic walks, grading and sodding, also water-proofing and cement work in interior court-yard.
Total amount of contract over \$55,000. Laid under the supervision of
G. W. Aldridge, Superintendent of Public Works.

Vulcanite Portland Cement used
Vulcanite Paving Co., Contractors



JONES & LAUGHLIN COKE OVENS
Pittsburgh, Pa.

E. K. Morse, Engineer in charge

200,000 bbls Vulcanite Portland Cement used in Jones & Laughlin's plants



THE NEWTON-CLAYPOOL BUILDING
Indianapolis, Ind.

Architect, John H. Stem

Wm. P. Jungclaus & Co., General Contractors

Vulcanite Portland Cement used for concrete foundations, floors and
sidewalks by Julius Keller



ST. PATRICK'S, BALTIMORE, MD.

Architects, D. H. Burnham & Co.

Vulcanite Portland Cement used



CONCRETE BRIDGE AT SUMMER HOME OF P. D. ARMOUR, JR.
Oconomowoc, Wis.

Designed by C. F. Hall, C. E., Chicago

Contractors, Stamson & Blome

Vulcanite Portland Cement used



CONTINENTAL TRUST CO.
Baltimore, Md.

Architects, Baldwin & Pennington

Builder, Chas. McCaul

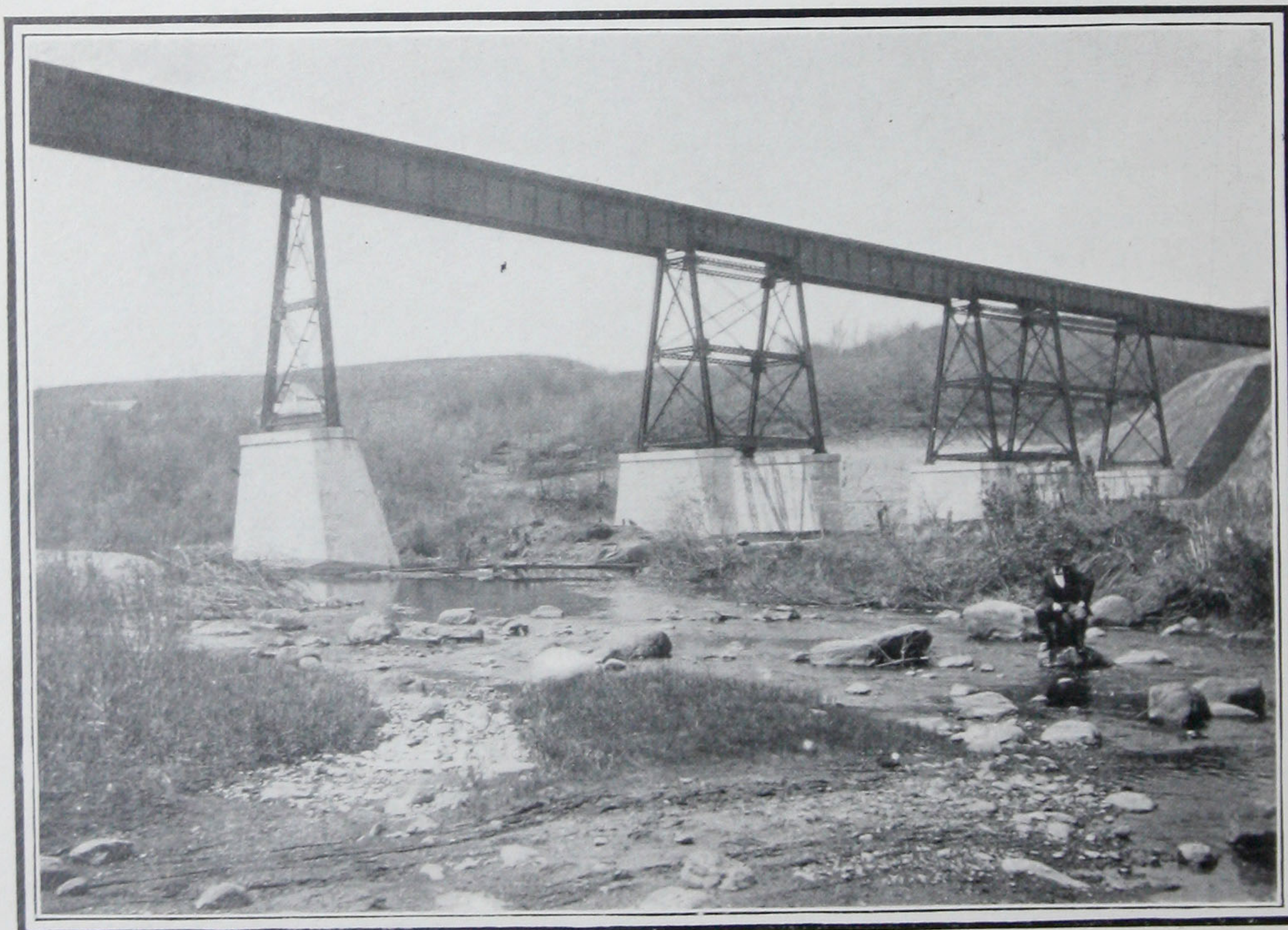
Vulcanite Portland Cement used throughout



NATIONAL UNION BANK
Baltimore, Md.

Architects, Baldwin & Pennington

Vulcanite Portland Cement used throughout



BRIDGE BUILT BY C. M. St. P. RY.,
Janesville, Wis.

H. J. Whittemore, Chief Engineer

Onward Bates, Engineer of Bridges and Buildings

More than 15,000 bbls. of Vulcanite Portland Cement were used in this and similar
construction on this line

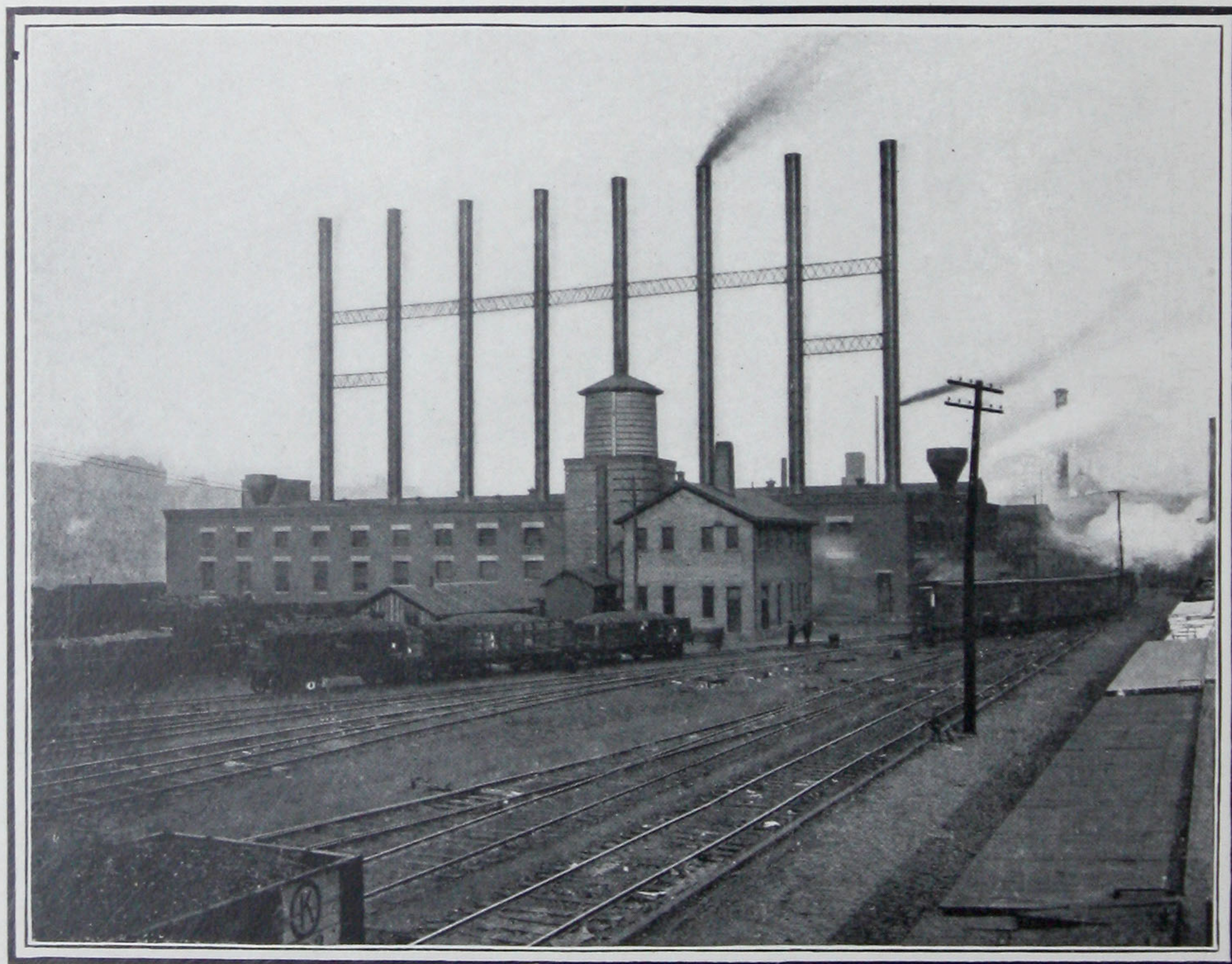


RESIDENCE OF E. J. BERWIND, ESQ.
Newport, R. I.

Architect, Horace Trumbauer

Builders, Geo. F. Payne & Co.

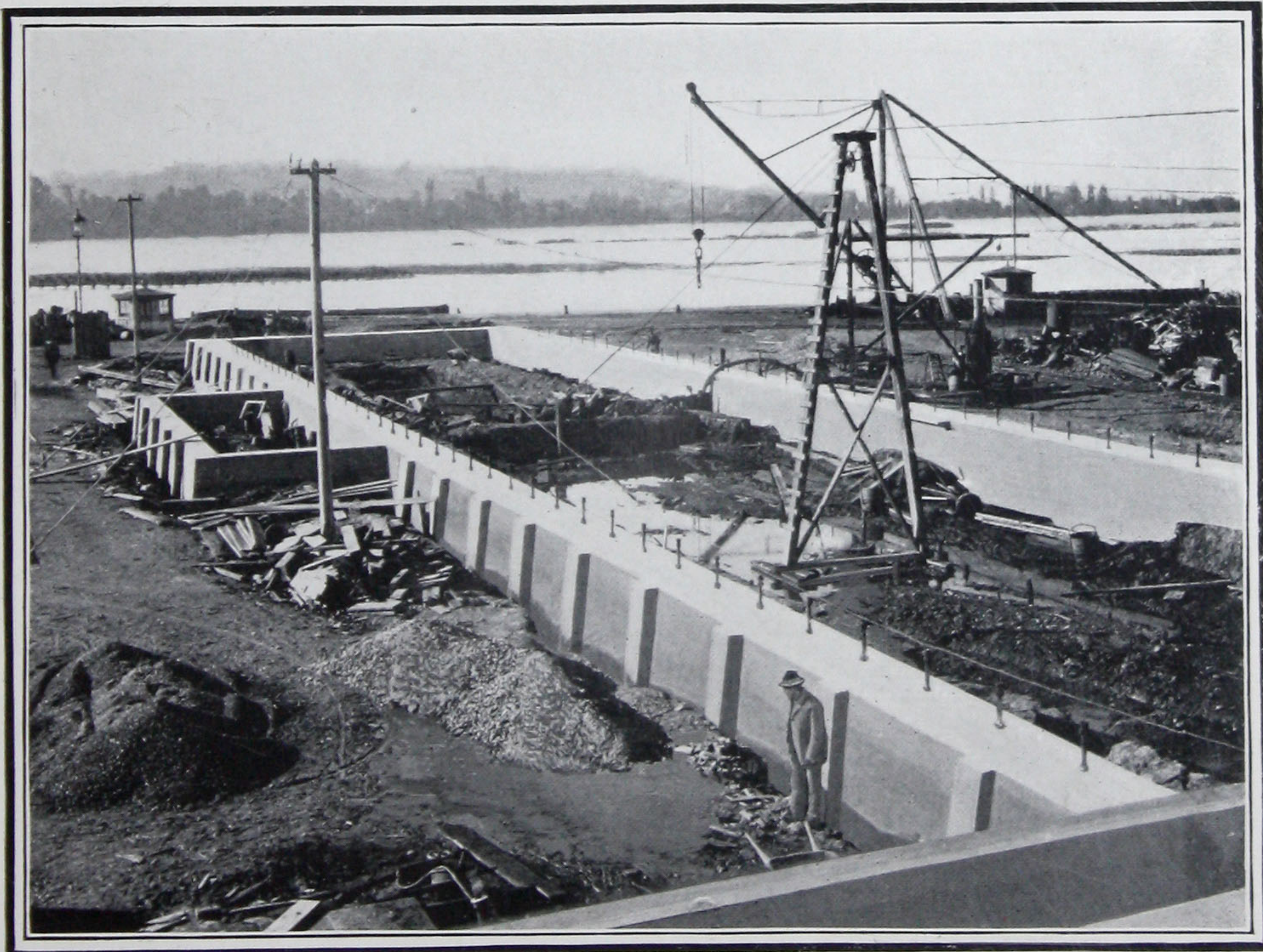
Vulcanite Portland Cement used throughout



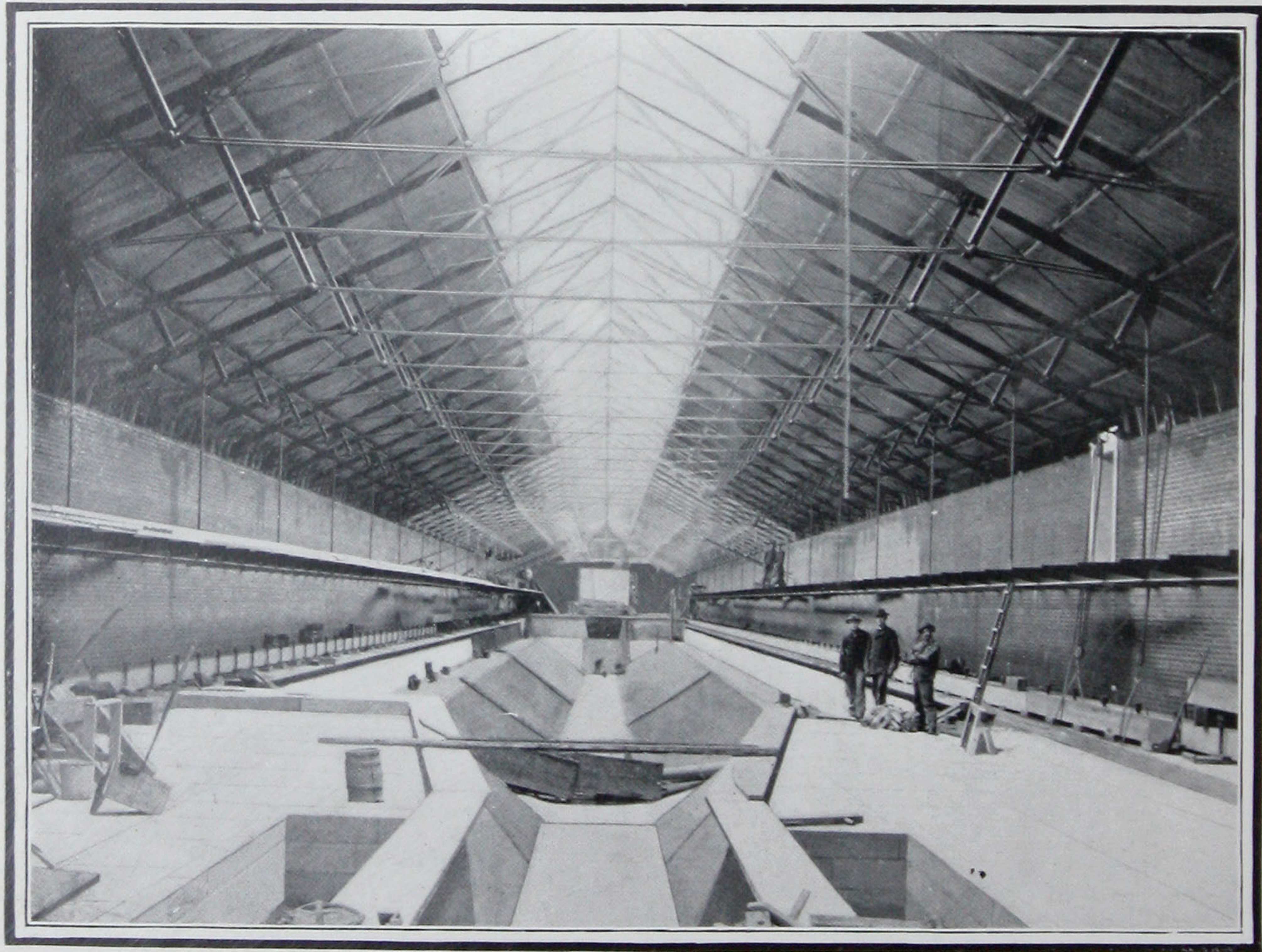
CONSOLIDATED TRACTION CO. POWER PLANT
Pittsburgh, Pa.

Engineer, G. F. Greenwood

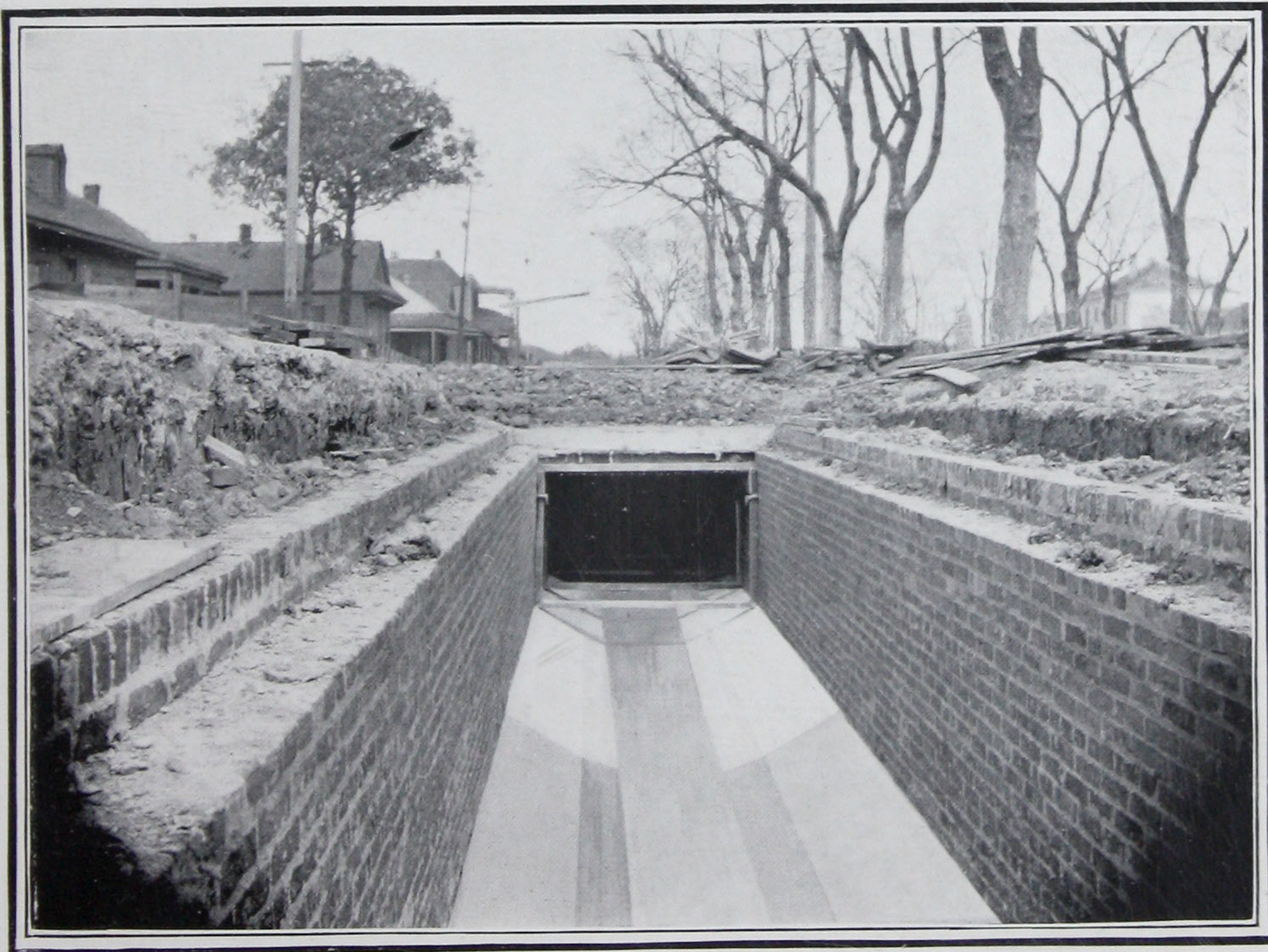
More than 25,000 bbls. Vulcanite Portland Cement used in foundations and superstructure



FOUNDATIONS OF EXPERIMENTAL MODEL BASIN
Bureau of Construction and Repairs, Navy Department, Washington, D. C.
Vulcanite Portland Cement used throughout
Cranford Paving Co., Contractors



EXPERIMENTAL MODEL BASIN
Bureau of Construction and Repair, U. S. Navy Department, Washington, D. C.
Vulcanite Portland Cement used throughout
Cranford Paving Co., Contractors



SECTION OF DRAINAGE CANAL, NEW ORLEANS, LA.
National Contracting Co.

Vulcanite Portland Cement used throughout



LEMOYNE WAREHOUSE
Chicago, Ill.

Architects, Holabird & Roche

Contractors, Stamson & Blome

Vulcanite Portland Cement used in foundations, floors and roof



LEHMAN FLAT

The largest flat building in Chicago, Ill.

Architect, Edmund R. Krause

Contractors, Stamson & Blome

Vulcanite Portland Cement used

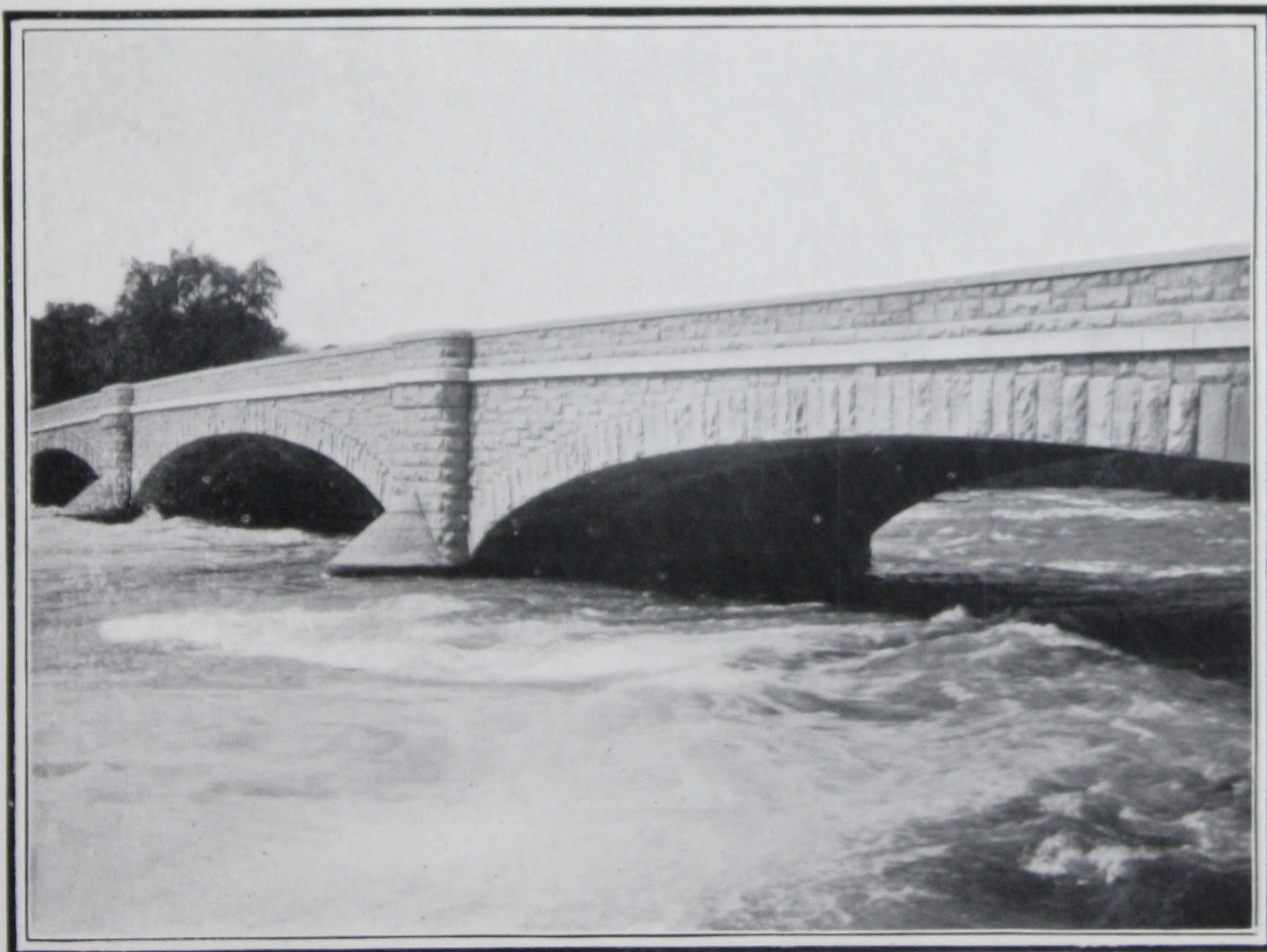


COURT HOUSE, BLOOMINGTON, ILL.

Architects, Reeves & Bailie, Peoria, Ill.

Contractors, Peoria Stone & Marble Co., Peoria, Ill.

4000 bbls. Vulcanite Portland Cement used



BRIDGE FROM MAIN LAND TO GREEN ISLAND
Niagara Falls, N. Y.

Contractors, W. H. Keepers & Company, New York

Vulcanite Portland Cement



COMBINATION CURB AND GUTTER—LINCOLN PARK
Chicago, Ill.

Vulcanite Portland Cement used very extensively in Lincoln Park system, under Paul Raediesky, and
A. A. Babcock, C. E., in charge



RESIDENCE OF P. A. B. WIDENER, ESQ.
Elkins, Pa.

Architect, Horace Trumbauer

Builders, Geo. F. Payne & Co.

Vulcanite Portland Cement used throughout



RESIDENCE OF W. L. ELKINS
Elkins, Pa.

Architect, Horace Trumbauer

Builders, Geo. F. Payne & Co.

Vulcanite Portland Cement used throughout



MERCHANTS WAREHOUSING CO.
Philadelphia, Pa.
Vulcanite Portland Cement used throughout
Contractors, Geo. A. Fuller Co., Vulcanite Paving Co.



REAL ESTATE TRUST BUILDING

Broad Street, Chestnut to Sansom Street, Philadelphia

HALLOWELL AND NORTH AMERICAN BUILDINGS

All cement work and water-proofing in above buildings

Vulcanite Portland Cement used

Edgar V. Seeler, Architect

Doyle & Doak, Builders

F. C. Roberts & Co.

Jas. H. Windrim

Engineers of The Real Estate Trust Building

Architect for the North American Building

Vulcanite Paving Co., Contractors



UNITED STATES MINT

All granolithic work throughout building, court-yards and sidewalks
Vulcanite Portland Cement used

J. Knox Taylor, Architect

Amos J. Boyden, Architect in charge
Vulcanite Paving Co., Contractors

Charles McCaul, Builder



DINING ROOM OF JERSEY CITY STATION, P. R. R.

Floor laid with Granolithic

Vulcanite Portland Cement used

Vulcanite Paving Co., Contractors



WAITING ROOM OF JERSEY CITY STATION, P. R. R.

Floor laid with Granolithic

Vulcanite Portland Cement used

Wm. H. Brown, Chief Engineer

Mr. L. H. Barker, Principal Assistant Engineer

Mr. M. L. Gardiner, Assistant Engineer

Vulcanite Paving Co., Contractors



PASSENGER STATION, P. R. R., GERMANTOWN JUNCTION

All granolithic floors, sidewalks, tunnels, platform and curbing

Vulcanite Portland Cement used

Wm. H. Cookman, Architect

Wm. H. Brown, Chief Engineer

Vulcanite Paving Co., Contractors



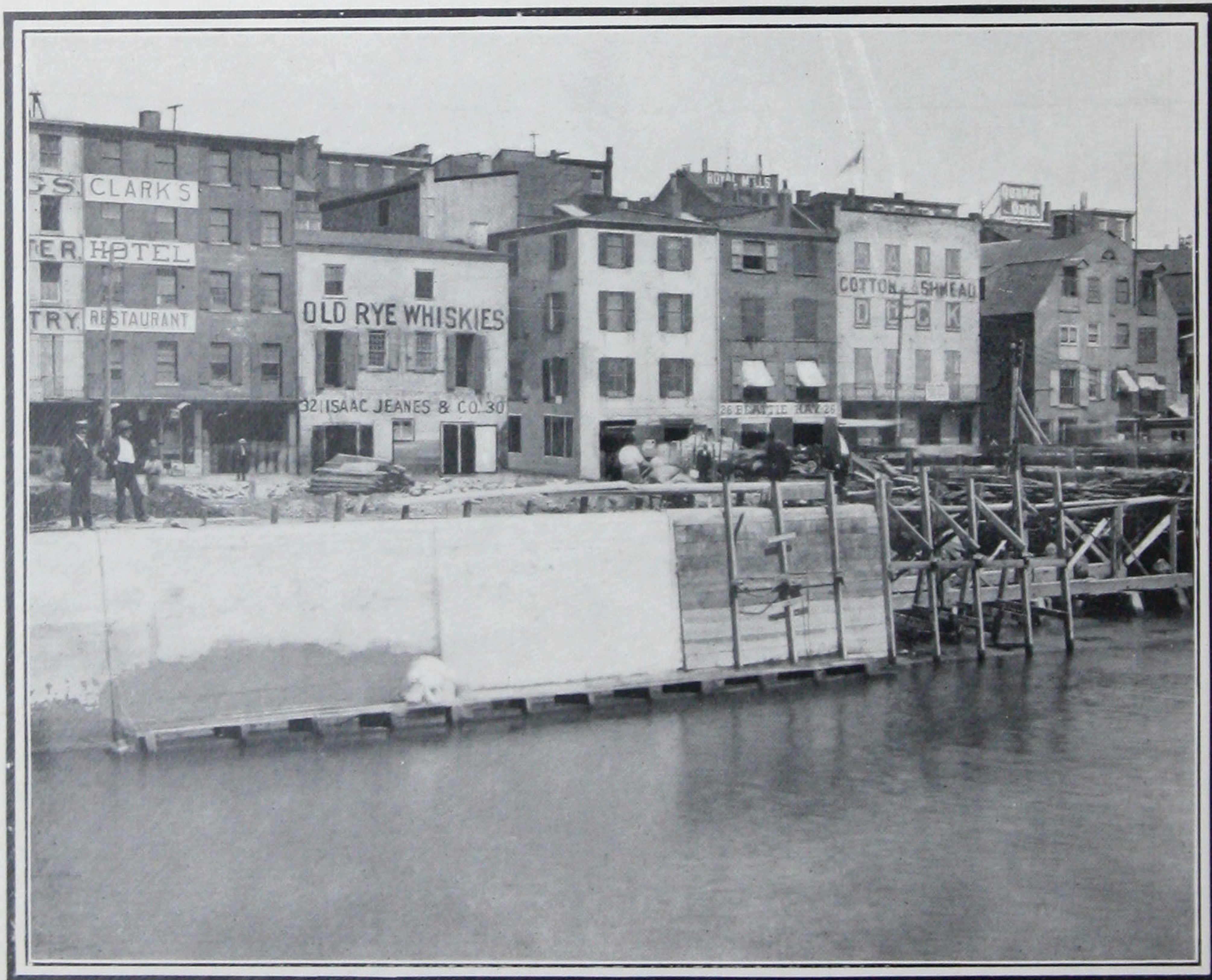
MARKET SQUARE, GERMANTOWN, PA.

Cement Coping and granolithic sidewalks around the whole square

Vulcanite Portland Cement used

Bureau of City Property, Geo. G. Pierie, Chief

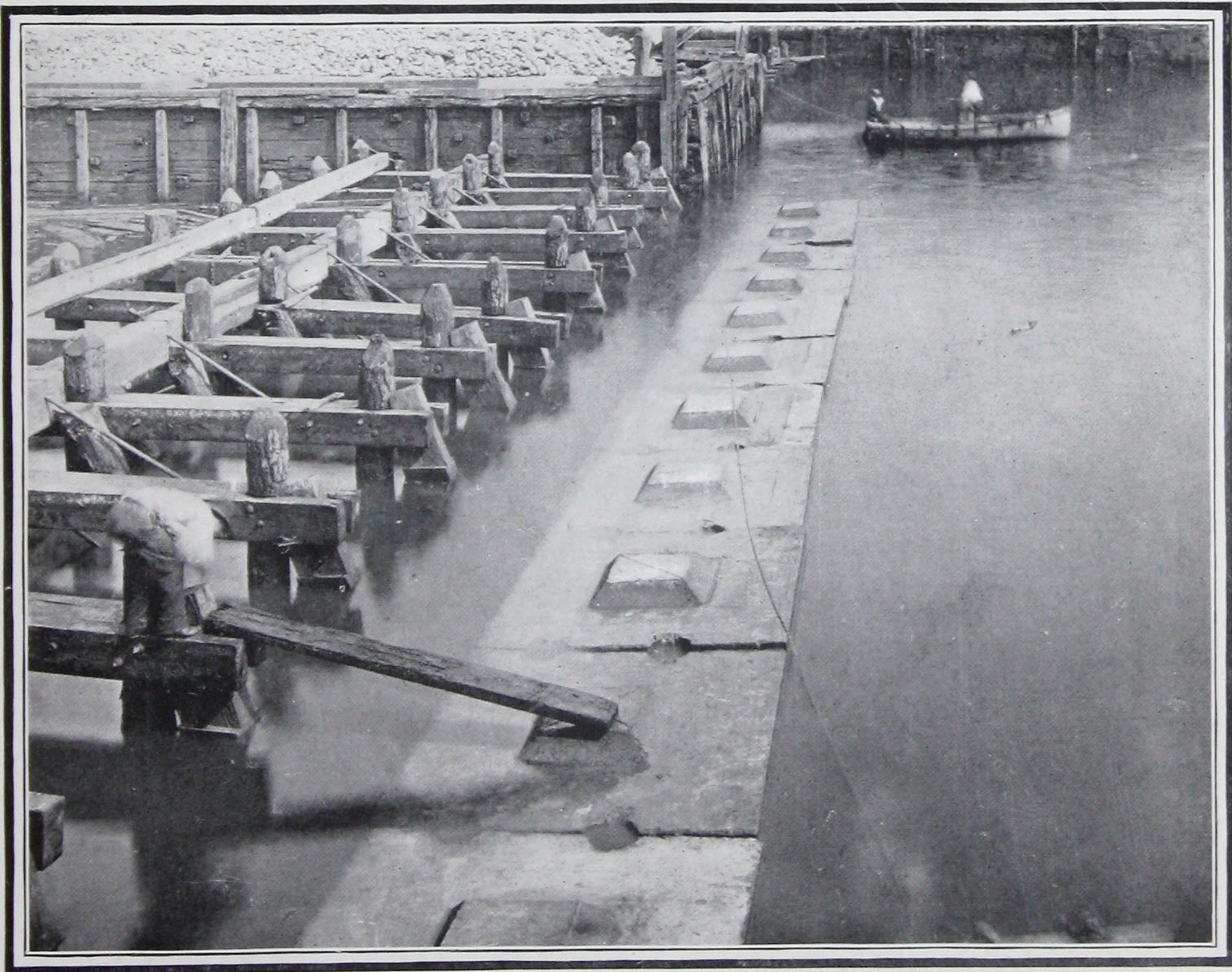
Vulcanite Paving Co., Contractors



BULKHEADS ALONG DELAWARE AVENUE

Bulkhead wall built on top of concrete blocks

Vulcanite Portland Cement used



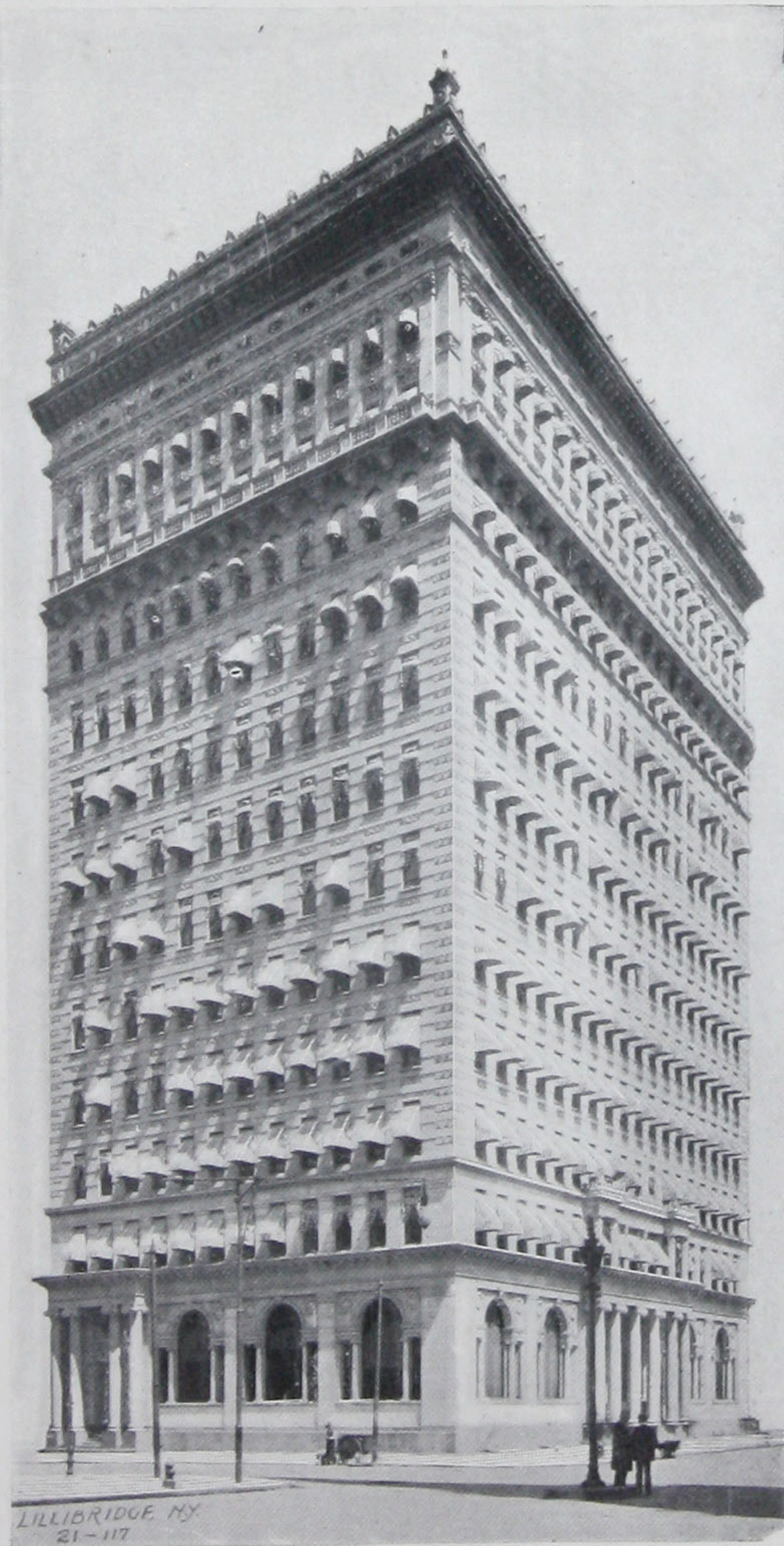
BULKHEADS ALONG DELAWARE AVENUE

Thirty-two ton blocks of concrete placed in line and ready for bulkhead wall
Vulcanite Portland Cement used



STEPHEN GIRARD BUILDING
Philadelphia

Architects, J. H. and Jno. T. Windrim Builders, Doyle & Doak



UNITED GAS IMPROVEMENT CO. BUILDING
Broad and Arch Sts., Phila.

Wilson Bros., Architects and Engineers
Builder, Geo. F. Payne
Vulcanite Portland Cement used

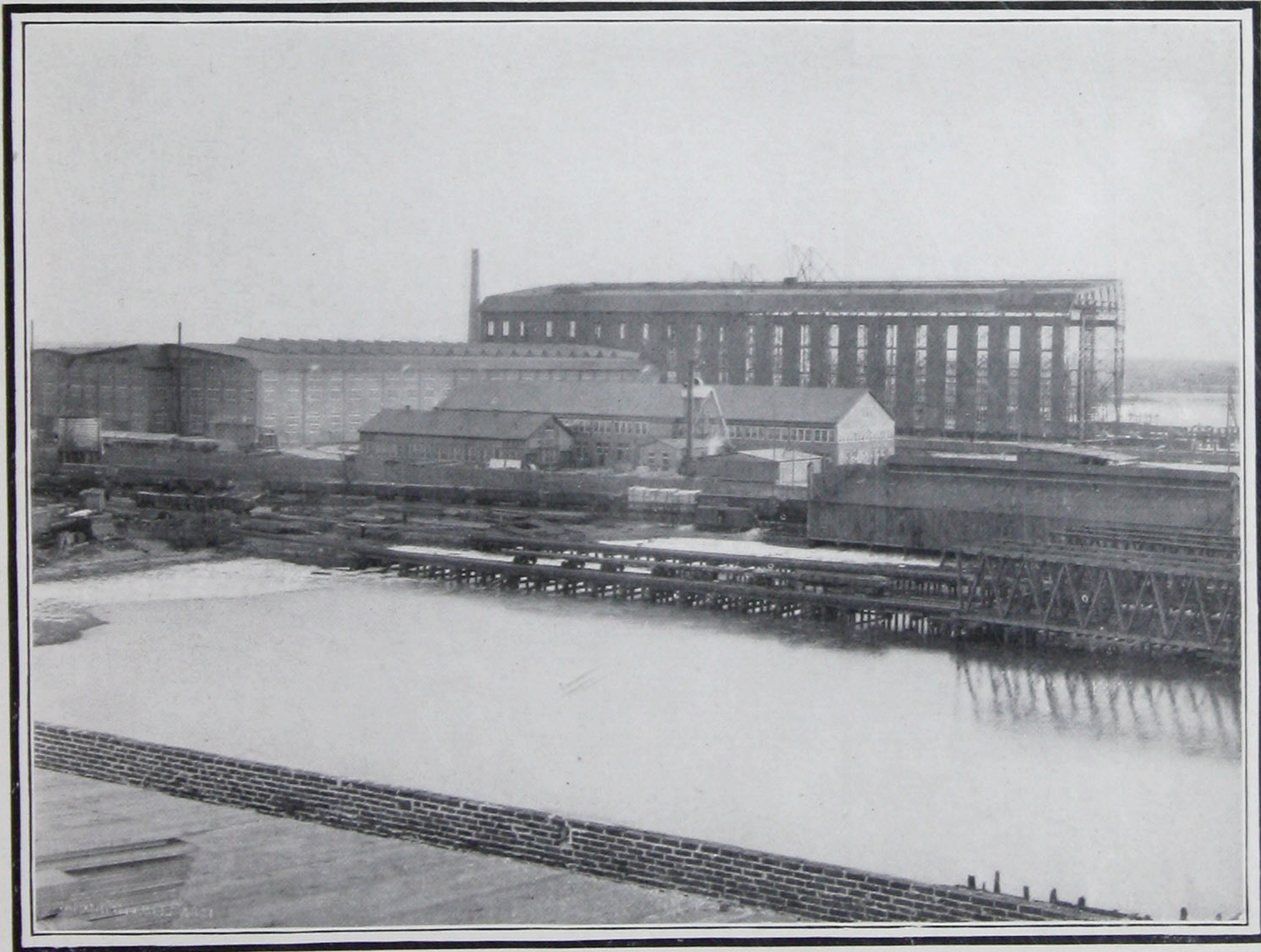


SUGAR REFINERY ON RIVER FRONT, CAMDEN, N. J.
Foundations for the Sugar Refinery on river front at Camden, N. J.

Vulcanite Portland Cement used

Geo. M. Newhall Engineering Co., Architects

Vulcanite Paving Co., Contractors



NEW YORK SHIP BUILDING CO.
Camden, N. J.

25,000 bbls. Vulcanite Portland Cement used



MARINER AND MERCHANT BUILDING
Philadelphia, Pa.

Architect, Jas. H. Windrim

Contractors, W. A. & A. E. Wells

Vulcanite Portland Cement used throughout



LAND TITLE AND TRUST BUILDING
Philadelphia, Pa.

Architects, D. H. Burnham & Co.

Builder, Chas. McCaul

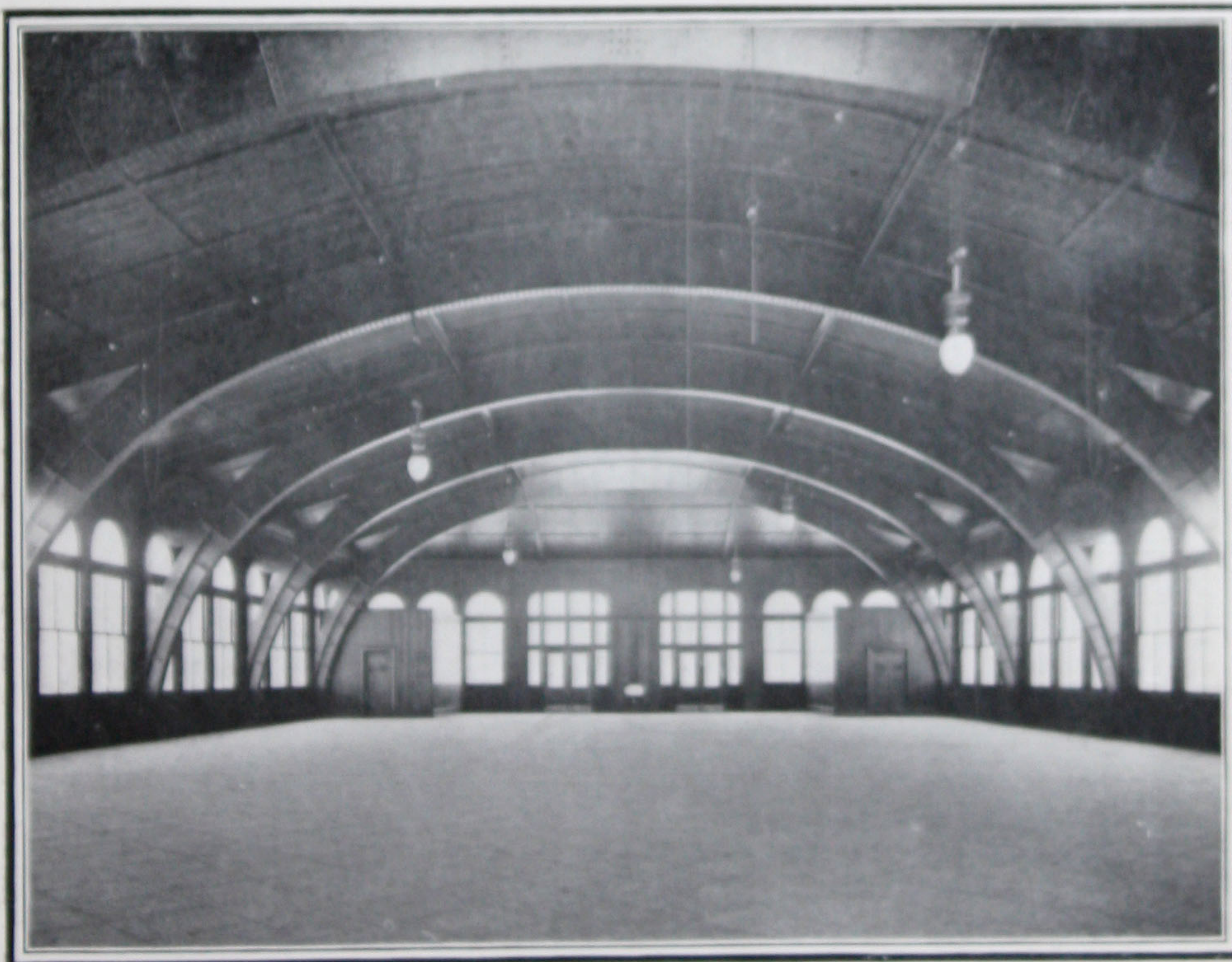
Vulcanite Portland Cement used in foundations, floors
and superstructure



THE METHODIST HOME
Philadelphia, Pa.

Architects, Hales & Ballenger

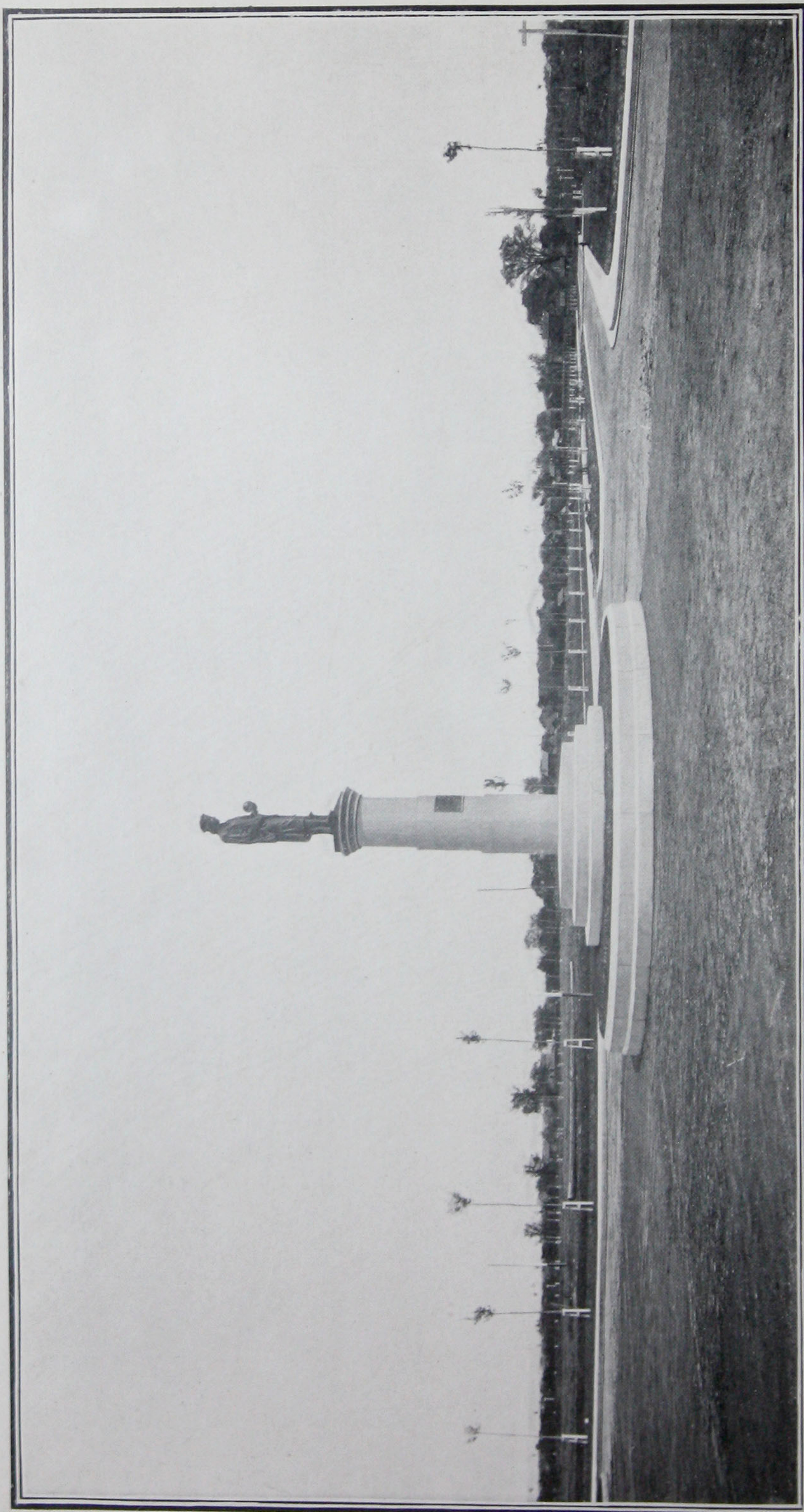
Vulcanite Portland Cement used throughout



PLEASURE PIER, DELAWARE AVENUE, FOOT OF CHESTNUT STREET

All water-proofing and granolithic and cement work. Vulcanite Portland Cement used

Geo. S. Webster, Chief Engineer, Bureau of Surveys Geo. Datesman, Principal Assistant Engineer
Norman L. Stamm, Assistant Engineer
Vulcanite Paving Co., Contractors



STATUE OF CHRISTOPHER COLUMBUS, PEORIA, ILL.
Pedestal and coping around this statue made of Vulcanite Portland Cement



STATUE ON TOP OF WORKS OF W. H. JENNINGS MFG. CO.
Architectural and Decorative Composition Ornaments, Kansas City, Mo.
Cast out of Vulcanite Portland Cement

COMPARATIVE TABLE

Showing growth of "Vulcanite" Sales

BARRELS.								
1895	(6 mos.)	1	4	0	0	0	(6 mos)	1895
1896		6	0	0	0	0		1896
1897		1	2	5	0	0	0	1897
1898		2	1	8	0	0	0	1898
1899		5	1	3	0	0	0	1899
1900		6	9	0	0	0	0	1900
1901		7	2	5	0	0	0	1901
1902		9	7	5	0	0	0	1902

Where Vulcanite has been used.

10,000 Bbls.	Chicago & Alton Railway Co.
10,000 "	Maryland Steel Co., Sparrows Point, Md.
10,000 "	Cambria Steel Co., Johnstown, Pa.
10,000 "	United Coke & Gas Co., Camden, N. J.
10,000 "	New Bellevue Stratford Hotel, Philadelphia.
10,000 "	Pennsylvania Co. Track Elevation, Allegheny, Pa.
10,000 "	New Jersey State Reformatory, Rahway, N. J.
12,000 "	Great Northern Ry. Co., Cascade Tunnel.
15,000 "	New Land Title Building, Philadelphia, Pa.
15,000 "	Edison Portland Cement Co. Plant.
16,000 "	Barber Asphalt Paving Co., Fifth Ave. Paving, New York.
20,000 "	New Orleans Drainage Canals.
20,000 "	Chicago, Rock Island & Pacific Railway Co.
20,000 "	P. B. & L. E. R. R. Bridges, Allegheny & Monongahela Rivers.
35,000 "	Chicago, Milwaukee & St. Paul Ry. Co.
50,000 "	Powell Bros., Cement Contractors, Chicago, Ill.
50,000 "	Penna. R. R. Union Station and other improvements, Pittsburg, Pa.
50,000 "	Metropolitan St. Ry. Co. Track Work, New York.
50,000 "	Geo. A. Fuller Co. Buildings, New York in 1902.
60,000 "	Philadelphia & Reading Subway, Philadelphia, Pa.
85,000 "	East Boston Tunnel and Approaches, Boston, Mass.
96,000 "	Consolidated Lake Superior Power Co., Sault-ste-Marie, Mich.
100,000 "	Stamsen & Blome, Cement Contractors, Chicago, Ill.
150,000 "	Cranford Paving Co., Washington, D. C.
200,000 "	Jones & Laughlin Plants, Pittsburg, Pa.
200,000 "	Vulcanite Paving Company, Philadelphia, Pa.

